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Very Respectfully,

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THE

UNITED SERVICE.

JANUARY 1880.

DISCUSSION OF THE EXPLOSION OF THE 38-TON GUN ON BOARD H.M.S. "THUNDERER."

"It will be observed that the committee, in stating their grounds for arriving at the cause which burst the gun, have referred to no other evidence than that offered by the remains of the gun itself, and by also, for what it is worth, the evidence given by the stud, and by the recoil, and have not even brought into account, as they might have done, the fact that every other suggestion which has been put forward fails commonly when considered alone, but always when considered in relation to the evidence given by the remains of the gun. The committee have attached so much importance to the evidence of this inanimate witness, because it is not liable to the errors arising from want of observation, or to those arising from forgetfulness, or to those which in this case may well be due to the terrible shock sustained by all who were witnesses of the disaster."—*Report of the Committee appointed to inquire into the Cause of the Bursting of one of the 38-ton Guns in the Turret of H. M. S. "Thunderer," 13th February*, 1879.

IN the July number of THE UNITED SERVICE the writer advanced the hypothesis that the explosion of the 38-ton gun on board H. M. S. "Thunderer" was caused by the wedging action of the fragments of an empty cast-iron shell, fractured along planes of weakness by the shock of discharge. The grounds of this hypothesis were given, with such illustrations as incidental experience afforded.

Since the article referred to was written, the official report of the committee appointed to inquire into the causes of the bursting of the gun has been published, with minutes of proceedings, and an appendix, embracing, with other matters, reports of experiments carried out by the committee with the view of elucidating various points connected with the working of the guns; the report of Major Owen, R.A., on the state of the gun in the fore-turret, with thirteen plans; two plans

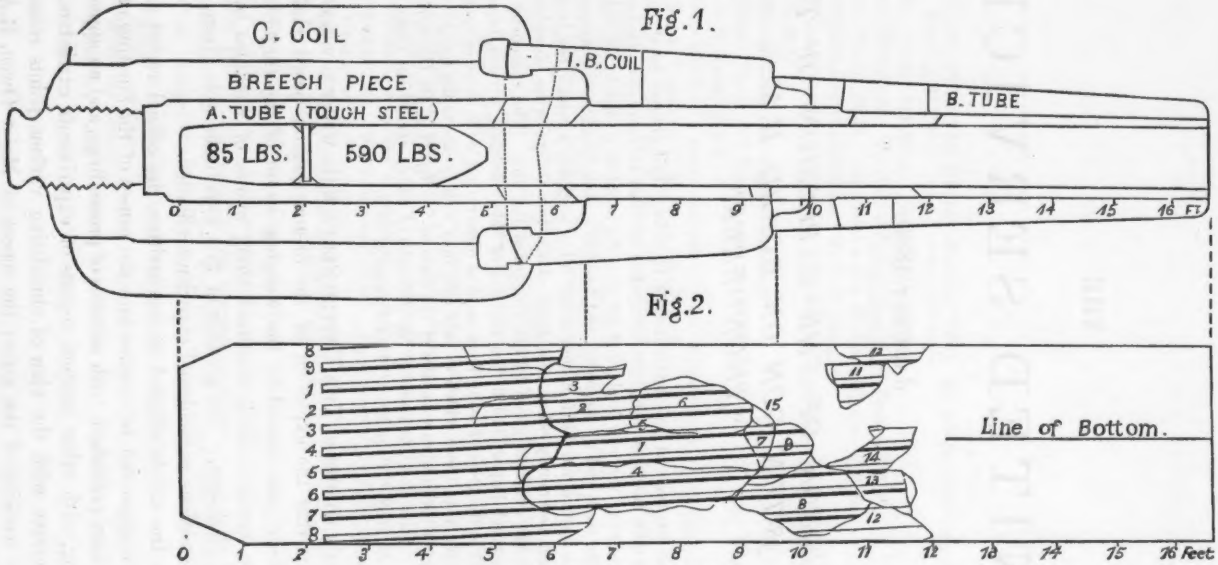
Fig.1.
C. Coil
I. B. Coil
Breech Piece
A. Tube (Tough Steel)
B. Tube
85 lbs.
590 lbs.
0 1' 2' 3' 4' 5' 6 7 8 9 10 11 12 13 14 15 16 Ft
Fig.2.
Line of Bottom.
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 Feet

Fig. 1. Vertical section of gun, showing lines of fracture (from Major Owen's plans).
Fig. 2. Internal development of bore (from Captain Noble's plan).

by Captain A. Noble, a member of Sir William Armstrong's firm, one showing the position that would be occupied by the cartridges and projectiles "on the hypothesis of a double charge," the other showing "the circumstances of the burst made up with the present state of the gun."

It is proposed to discuss the observed results of the explosion so fully given in these carefully prepared reports and diagrams, and to show that they are physically in accordance with the hypothesis of a single charge and a wedging shell. As the official report is not generally accessible in this country, it will be necessary to quote such parts as may be essential to a clear understanding of the subject. First, as to the construction and dimensions of the 38-ton guns of the "Thunderer:" "The barrel is formed of a steel tube bored out of a solid hammered ingot, and hardened and toughened in oil. The whole length of the bore is 198 inches (16 feet 6 inches), and the diameter, exclusive of the rifling, is 12 inches. The rifling consists of 9 grooves, about $1\frac{1}{2}$ inches wide, and $\frac{2}{10}$ deep. The grooves commenced at $27\frac{1}{2}$ inches from the breech end of the bore. At this point the grooves are parallel with the bore, but they at once commenced to depart from that parallelism, and the rate of departure goes on increasing by regular increments until at the muzzle of the gun the obliquity of the grooves is equal to a helix of 1 in 35 calibres.

"The external diameter of the steel tube at the breech end is $19\frac{1}{2}$ inches; this diameter is continued for 79 inches forward, where it is reduced to 19 inches diameter for a length of 44 inches, then to $18\frac{3}{4}$ inches diameter for a further length of 5 inches, and then to 17 inches diameter for the remaining 70 inches, making up the full length of the bore of the gun. The breech end of the steel tube is 6 inches thick, so that the total length of the steel tube externally is 204 inches.

"The rear end of this steel tube and the whole of its length as far as the first decrease of diameter before mentioned are enveloped in a wrought-iron cylinder called the 'breech-piece;' this piece extends in the rear of the breech of the tube for 18 inches, and into its centre is fitted the cascabel screw. Against this screw and against two shoulders in the breech-piece is received the endway pressure exerted by the steel tube when firing. The thickness of the breech-piece is 8 inches, and its exterior diameter, therefore, is $35\frac{1}{2}$ inches. Outside the breech-piece there is another envelope of wrought iron, called the 'C coil,' which extends to within $4\frac{1}{2}$ inches of the rear of the breech-piece, and goes forward to within 10 inches of the front end of the breech-piece. The thickness of the C coil is 11 inches, and its external diameter, therefore, is $57\frac{1}{2}$ inches, this being the extreme diameter of the gun. On the C coil are the trunnions; these are situated at $48\frac{1}{2}$ inches in advance of the breech end of the bore. In front of the breech-piece the tube is surrounded by a wrought-iron envelope called the '1 B

coil.' This is conical on its outer surface, being 43¼ inches diameter at its rear end, and 39$\frac{11}{16}$ inches diameter in the body part at the front end. The rear end of the 1 B coil is hollowed out so as to extend backwards as much as 20 inches over the breech-piece, and 10 inches within the front end of the C coil around the breech-piece, a groove being made partly in the breech-piece and partly in the C coil to received this hollowed-out end of the 1 B coil. In advance of the 1 B coil is the B tube, which extends from the 1 B coil to the muzzle of the gun; the B tube is conical externally, and is 29 inches diameter at its rear end and 21½ inches diameter at the muzzle; the rear end of the B tube is hollowed out for a length of 10 inches, to embrace a projection on the front end of 1 B coil. Thus it will be seen the gun is made of six pieces, viz.: the steel tube, the breech-piece, the C coil around the breech-piece, the 1 B coil in advance of these, the B tube in advance of this, and the 'cascabel' screw in rear of all. The breech-piece and the C coil have each been made by winding bars of wrought iron into a helix, and by welding the convolutions of that helix together so as to form a cylinder. To the end of the C coil cylinder has been welded the ring on which the trunnions are forged. The 1 B coil has been made by winding a bar of iron into a helix to form the inner part of the coil, and by winding another bar into a helix around the first coil to form the outer part of the coil; these two parts have then been heated together and welded into one mass. The B tube has been made by winding a bar into a helix, and by welding as in the other cases. All these forgings have been turned and bored, and then, having been heated to expand them, have been shrunk upon one another and upon the steel tube. At the places where the endway junctions between the different parts are made 'under cuttings' or 'hooks' have been formed so as to give longitudinal connection. The vent is situated 12 inches in advance of the breech end of the steel tube. Through the threads of cascabel screw there is a small longitudinal channel called the 'gas escape.' This channel communicates with an annular channel on the cascabel screw in rear of the steel tube; the object of this arrangement is to obtain an indication whether, owing to a flaw in the steel tube, gas is passing between that tube and the inside of the breech-piece. From these guns are fired both Palliser chilled projectiles and also common shells. The length of the Palliser shell, with its gas-check hereafter described, is 32 inches, that of the common shell is 35 inches. The weight of a Palliser shell empty, with its gas-check, is in round numbers, 700 pounds, and of the common shell with its gas-check, empty, 590 pounds.

"The shells are each provided with nine rows of gun-metal studs, three studs in each row, which studs project from the shell, and being received into the nine grooves of the rifling, give the rotatory motion

to the shell as it traverses along the bore. In the rear of the shell there is a disc of copper nearly fitting the bore of the gun and having its hinder edge turned thin. This is called the gas-check. The force of the explosion drives the thin edge of the copper close to the bore of the gun, and into the grooves, and thus by filling up the windage prevents the erosion of the bore which occurs when the heated gases rush violently between the projectile and the walls of the bore, and at the same time adds to a certain extent to the velocity of the projectile. When a Palliser shell is used, the charge of powder is commonly a battering charge, weighing 110 pounds, and occupying a length of 28 inches. With a common shell a full charge of 85 pounds is employed. This occupies a length of 22 inches. The powder is in the form of small pebbles, about $\frac{3}{4}$ inch cube; and is known as P. powder. The cartridge-bags are composed of coarse silk."

The copper gas-check referred to, weighing fourteen pounds, and covering the base of the shell, was less than three-tenths of an inch thick; not possessing sufficient stiffness to protect the shell, it would yield along the line of fracture, leaving an annular portion still serving as a gas-check. Its effect would probably be to render the wedging action more intense by covering lines of fracture, thereby preventing the passage of gas between parts of the fractured shell. A description of this form of "gas-check," which was devised by the writer and first applied in the Confederate Naval Service, where it was known as the "ratchet-sabot," is given by General Henry L. Abbot, United States Army, in "Professional Papers, Corps of Engineers, No. 14, 1867."

Before proceeding to discuss the evidence presented by the gun, we may consider the relative resistance to crushing, by direct thrust, of cast iron and steel.

It is a remarkable but well-known fact, first developed by Hodgkinson, that the resistance of cast iron to crushing is from five and a half to six times its tensile strength, whilst the resistance of wrought iron to crushing is less than its tensile strength. In the case of steel the ratio of "resistance to crushing" to "tensile strength" varies with the treatment to which it is subjected; and in some cases, as when heated to light red, hardened in water and tempered at blue heat, may be more than twice as great. The process of toughening the tube of mild steel in oil, as practiced at Woolwich, probably reduces the resistance to crushing to less than the tensile strength. Experiments made with reference to the use of steel for construction of the bridge over the Mississippi, at St. Louis, on bars of steel cut from the same mass, and submitted to different treatment, gave the following results:

	Tensile Strength, lbs. per square inch.	Crushing Weight, lbs. per square inch.
No. 1. In its original condition . . .	109,473 to 131,864	100,080 to 112,400
No. 2. Heated to bright red and cooled in oil at 78°	201,341 to 227,542	173,200 to 199,200

The steel of the Woolwich gun is stated by Commodore Simpson, of the United States Navy, in his valuable "Report on a Mission to Europe," to break when soft at 31 tons (69,440 lbs.); when toughened, at about 50 tons (112,000 lbs.). Comparison of these numbers with those given in the above table indicate that the resistance of the toughened steel to crushing is less than its tensile strength; that is, less than 112,000 lbs. per square inch. The resistance of cast iron to crushing ranges from 82,000 to 145,000 lbs. per square inch, the average being 112,000 lbs. It is to be presumed that the resistance to crushing of the cast iron of the 12-inch shell is not less than the average; it should be greater. This relative resistance to crushing by direct thrust, of the cast iron of the shell to that of the toughened steel of the tube, is to be considered in connection with the gas-tension, which acts, in conjunction with the wedging shell, by fluid pressure on the walls of the bore, to rupture the steel tube. It is assumed that the tensile strength of the steel tube is truly represented by that of the tested specimens.

It appears, however, from the report of the committee, that "owing to the difference of mass to be tempered, the tenacity to be expected from specimens cut from the tempered steel tube of a heavy gun would be less than that afforded by similar specimens taken from the tube before it is tempered, and which are themselves then tempered separately and tested, as is the custom in testing the steel of gun-tubes in the Royal Gun-Factory at Woolwich. Certain experiments seem to show that this difference may be represented, in some cases, by an addition of as much as thirty-three per cent. to the tenacity of the specimens from the tempered tube." Two test pieces from the steel tube of the "Thunderer's" gun gave a mean tensile strength of 36.83 tons (82,499 lbs.) per square inch of original section. It is suggested by the committee that "if in this case an addition of thirty-three per cent. be made, the mean tenacity represented by the steel tested by the committee would be over 48 tons per square inch."

It is to be observed, however, that this represented mean tenacity would be that of the specimens tested at Woolwich, not that of the tube. The proportion of this thirty-three per cent. due to the original difference between specimens and tube, as compared with that due to effect of strain resulting from the explosion of the gun, would be hard to determine.

Supposing the shell to have been fractured in the act of starting; the base to have taken the form of a frustrum of a right cone, the angle at the vertex 90°: the ratio of the total direct and lateral pressures, neglecting friction, would have been as 2 to 1. But the *intensity* of pressure upon the walls of the bore would have been inversely as the area of surface over which it was distributed. If we further assume the diameter of the base of the cone to have been 11.5 inches, one-half inch less than that of the bore, the ratio of the direct to the lateral

pressure, uniformly distributed over an area of 37.69 inches, corresponding to a length of one inch of bore, would have been as 1 to 1.4; for a length of one-half inch, as 1 to 2.8; and for a length of one-quarter inch, as 1 to 5.6.

The fracture occurring in the act of starting, the shell would have moved some distance before producing a wedging effect. The first apparent effect in the bore occurs at the distance of fifty-four inches from the breech end: "from this point to the transverse fracture of the tube the bore is bell-mouthed." At the point referred to, the pressure of the powder gases, under normal conditions, with a charge of eighty-five pounds of powder and a common shell, would (in accordance with Major Noble's diagram) have been 8.5 tons (19,040 lbs.) per square inch. Increasing resistance to the passage of the projectile would augment it; but assuming it to have remained the same, the lateral pressures on the walls of the bore would have been as follows: for bearings of one inch, one-half inch, and one-quarter inch in length, 11.9 tons (26,656 lbs.), 23.8 tons (53,312 lbs.), 47.6 tons (106,624 lbs.), per square inch respectively.

But the probability is that in consequence of the resistance opposed to the passage of the projectile between this point and the transverse break, the pressure of the powder gases was increased. If the projectile, instead of passing on at a comparatively high velocity, had been jammed and become immovably fixed at the distance of sixty inches from the breech end of bore, where the first crack appears, the direct pressure would probably not have been less than 15 tons (33,600 lbs.) per square inch; and in that case the lateral pressures corresponding to the above lengths of bearing would have been 21 tons (47,040 lbs.), 42 tons (94,080 lbs.), 84 tons (188,160 lbs.), per square inch. These figures represent a possible range of intensity of pressure to which the steel tube was liable. It exceeds, however, the resistance to crushing of either toughened steel or cast iron of average strength. It may be remarked of the distribution of lateral pressure on the walls of the bore that, from alterations of form, areas of bearing surface may change so suddenly as to produce local effects more intense and not less remarkable than those which are sometimes exhibited in the wave action of powder gases.

The following extracts from memorandum by Major John F. Owen, R.A. (see Appendix to Minutes of Proceedings), convey a very clear idea of the effects of the explosion upon the gun:

"MEMORANDUM.

"*State of No. 3 Gun generally. Vide Tracing No. 5.*

"II. The left gun—38-ton gun No. 3, of 12-inch calibre—is completely fractured circumferentially, near the point where the front

portion of the C coil or jacket overlaps the rear end of the 1 B coil.

"The coiled breech-piece, however, which is overlapped for a distance of twenty inches by this 1 B coil, remains intact.

"A small portion of the 1 B coil embraced between the C coil and breech coil remains round the whole circumference, and the fracture of the coil is irregular, as shown by tracing (2).

"We may therefore roughly take the gun in two parts,—(Y) and (Z).

"(Y) the breech portion remains on the carriage. It consists of the cascabel screw, the C coil or jacket, and the breech coil, together with a portion of the steel tube.

"This part (Y) embraces a total length of one hundred and ten inches, or somewhat less than half of the whole length of the gun, and a length of bore of about seventy-eight inches, or about two-fifths of the whole length of bore.

"The part (Z) consists of the 1 B coil and B tube, together with the part of the steel tube surrounded (immediately or otherwise) by those coils. (Z) has a total length of one hundred and twenty inches, or somewhat more than half of the whole length of the gun, and contains a portion of the bore of the same length, *i.e.*, about three-fifths of the whole length of the bore. Of (Z) the greater portion has been recovered on board in the shape of fragments, with the exception of about fifty-two inches of the muzzle end (or about a quarter of the whole length), no parts of which are forthcoming.

"It may be well first to describe more in detail the condition of the broken-up half (Z) of the gun.

"*1 B Coil. Vide Tracing No.* 9.

"With the exception of the part already mentioned, the whole of the 1 B coil is broken up into fragments. The positions of those recovered, as found after the explosion, as well as their dimensions, etc., etc., are described further in paragraph VI., page 7.

"It will be seen by tracing 9, attached, that almost the whole of this coil has been found. The total number of fragments which have been recovered is thirteen.

"I may mention that this portion of the gun (1 B coil) was made of a 'double' coil,—*i.e.*, of a coil over which was coiled a second bar, the whole then being welded together. The section of each of the bars was seven inches. Looking at the broken fragments, it would seem that the welding both of the folds of the coils and of the coils to one another was very good.

"*Steel Tube, Portion recovered. Vide Tracings* 4, 6, 8.

"III. The (A) steel tube is fractured completely, but irregularly,

about the same point as the 1 B coil, at about seventy inches from the bottom of the bore, and no part of the tube in front of the fracture remains with the breech portion (Y) of the gun. The tube is also cracked inwards for a length of about ten inches from the fracture, as will be described in detail further on. The portion of the tube—about seventy-six inches long—which had been embraced by the front portion of the breech-piece and by the whole length of the 1 B coil, appears to be represented by the fragments found on board (as described in paragraph VI.), which are fifteen in number.

"*Steel Tube, Portion not found.*

"IV. Of the remaining front portion of the steel tube,—*i.e.*, the muzzle portion of about 75 inches in length, which had been embraced immediately by the B tube,—the greater part has apparently been blown overboard, as no portions are forthcoming of the length of about 52 inches next the muzzle. Between 4 and 5 feet, therefore, of the muzzle portion are missing. As will be seen from tracing 10, this missing portion corresponds to the part of the gun which would extend from about the centre of the front port (when the gun was run out for firing) to the face of the muzzle.

"*B Tube. Vide Tracing No.* 10.

"V. The B tube—*i.e.*, the wrought-iron tube covering the steel barrel immediately, for a distance of 75 inches from the muzzle—appears also to have been blown overboard, with the exception of a length of about 35 inches towards the breech end of the tube, which is represented by the fragments found in the positions (mentioned in paragraph VI.), in all thirteen in number.

"The part of the deck in front of the port, at the time the gun was fired, is torn in several places by splinters, but it is not, of course, possible to tell whether the muzzle portion of the gun, of from four to five feet in length, which is missing, was broken up with the splinters, which did this damage, or whether it went overboard intact, the marks in this latter case being made by fragments of that part of the gun in rear of the muzzle portion mentioned.

"*Position of Fragments and Splinters after Explosion.*

"VI. . . . Of the six or seven large fragments of the 1 B coil, the three constituting the top portion were thrown upwards by the explosion, the rear piece towards the rear, and a front portion towards the front, which seems to point towards a centre of fracture about the middle of the 1 B coil, or about ninety inches from the bottom of the bore as far as this coil is concerned. Again, very little if any of the gun, either coil or tube, was apparently thrown straight forward

through the port, except a length of about four to five feet of the muzzle portion of the chase.

"*Examination of Splinters and Fragments as to Abnormal Indications.*

"It has not been possible for me as yet (being occupied each day in committee) thoroughly to complete a most important part of the examination of the gun,—that is, the critical examination of each splinter, and of the splinters of the steel tube, especially as to their interior surface. On the splinters mentioned below, however, abnormal indications are readily to be observed on inspection.

"Splinters 1, 2, and 3, which constitute a portion of the broken-up recovered part of steel tube, are indented at their rear ends (which would be about seventy-five inches from the bottom of the bore) as though compressed or ground by a circular or cylindrical body, the ends of these splinters towards the muzzle being at the time of the action tilted outwards.

"Splinters 12 and 13, which are, on the contrary, part of the muzzle end of the recovered broken-up portion of the steel tube, are indented in a somewhat similar but much more marked manner, and in their case evidently by a hard body with curved outline, which, going with a great velocity, has grazed the fragments. The muzzle ends of these fragments (about one hundred and forty-five inches from the bottom of the bore) are grazed as though their breech ends were tilted outwards before the grazing was effected.

"The indentation in the fragment number 13 has an outline which fits well on the exterior of a 12-inch projectile, as shown by placing it, at an angle, against such a shell. These indications would all be accounted for if we suppose the fracture of the tube to have commenced somewhere midway between the two sets of fragments, or, say, about ninety to one hundred inches from the bottom of the bore, so that the tendency would be for the pieces 2 and 3 to be tilted outwards, pivoting on their breech ends, and for 12 and 13 similarly to pivot outwards, but on their muzzle ends; and supposing, further, that these ends about which they were pivoting when forced outwards by the explosion had not had time to get out of the way of a projectile which had begun its forward motion through the bore about the time when fracture took place.

"*Remaining Portion of Gun. State of Interior as to Flaws and Impressions taken. Vide Tracing No.* 11.

"VII. Inspection of the remaining breech portion (Y) of the gun showed cracks in the steel tube extending to within about sixty-two inches of the end of the bore,—that is to say, about ten to fifteen inches inward from the point of fracture of the tube. These cracks are shown in Tracing 11. It will be seen that they represent, apparently, much

more the outline of the inner end of a splinter broken off than cracks usually to be found in a steel tube cracked or split.

"*Expansions of Bore, etc.*

"VIII. Measurements taken of the part of bore remaining show an expansion which, though very slight, at eighteen inches inwards from the point of fracture (or about fifty inches from bottom of bore), increases very rapidly as that point is approached, so that at six inches from point of fracture (or about seventy-two inches from bottom of the bore) the tube is expanded by more than half an inch. Tracing No. 11 and Table A, attached, exhibit the expansion of the tube here. There is also, as will be seen, an expansion of the bore towards the bottom, which is abnormal, but these measurements require further verification and amplification. It will be seen that from the point where the expansion begins, at fifty inches from the bottom of the bore, both grooves and lands are expanded in nearly regular increments.

"*Recoil and Final Position of Breech Portion.*

"IX. The recoil of this gun and its carriage had plainly been very violent, the buffer at the end of the slide having been driven through the rear transom of the carriage, which has been forced back to the utmost limit. The breech portion of the gun remaining was at an elevation of 17°, the cascabel button being forced hard down on the top of the rear transom of the carriage and the elevating arrangement damaged."

In order to form some conception of the intervals during which certain actions occurred, or certain effects were produced in the course of the explosion, we may consider the velocity the projectile would have acquired in traversing that part of the bore between its base and the first crack, a distance of thirty-two inches,—nearly a thousand feet per second; and this we may regard as the velocity of the projectile at the instant of commencement of complete circumferential fracture, and with which it passed out of the breech-piece. It would at this rate have traversed an inch in the one twelve-thousandth part of a second. That the velocity was high we know from the fact that from one fragment of the steel tube, No. 13, "a portion exactly fitting the projectile was scooped out." Assuming the gun to contain a charge of eighty-five pounds of powder and a common shell; that upon discharge the base of the shell, in the form of a conical wedge, is driven in; and that simultaneously the shell moves forward; it is obvious that the effect would be to expand the shell while so moving until it pressed on all the lands; and, as the windage is small, this might occur without further fracture. Should such further fracture, however, occur, its direction would probably be determined by the positions of the holes into

which the studs are fitted. Of these there are twenty-seven, in nine rows of three each. But, "crushing by shearing or sliding of portions of the block along oblique surfaces of separation is characteristic of substances of a granular texture like cast iron." Hence no diminution of pressure on the lands could be anticipated, for the parts of an unloaded shell between the lands and the wedging base would be "keyed" together. Greater pressure might result from such a system of wedge-formed fragments.

The surfaces of contact of lands and shell being smooth, nearly concentric, and of different metals, no evidence of excessive pressure would be presented in the form of *seizure;* such action, within the limits of ultimate strength, would tend rather to smooth away existing roughness of land, leaving perhaps a trace in the form of a faint bright mark, such as might be made by a burnishing-tool with great pressure. Under such pressure and so moving, the cast iron of the shell would, as it has been known to do, take the grooves; not so fully as would softer metals, but sufficiently to give rotation to the projectile, and, without pressing the studs forcibly, on the bottom surfaces of the grooves, to relieve them of shearing stress. But this local pressure in the case of a steel tube uniformly supported by external coils of wrought iron would cause it to take, in section, a polygonal form, flattening the grooves and stretching the metal, giving an actual increase of surface to the groove and a longer chord,—greater extension than would correspond to strain produced by excessive tension of gases, if we consider merely the difference of thickness of metal due to depth of groove. And this effect would be still further increased by the balanced lateral components of the pressure of the cast iron upon the curved sides of each land. That part of the shell which was cylindrical, expanded by a conical wedge, has itself become conical; the lines of action between it and the steel tube are normal to their surfaces, in sliding contact, and are therefore inclined forward. The radial forces tending to shear, and, combined with the pressure of the gases, to produce hoop-tension. The component force, including that of friction, parallel to the walls of the bore, tending to produce extension of the tube in the rear of the projectile, and, modified by tension due to bending, compression in front.

To these combined stresses may be attributed the transverse cracks, at the distance of about fifty-six inches from the breech, prolonged as longitudinal cracks to the complete circumferential fracture which, between points sixty-seven and eighty inches from the breech end of bore, terminates that portion of the steel tube remaining in the gun. Comparison of the "development of the steel tube," Plate No. 8, and "development of gutta-percha impression of the bore," Plate 11 (see Appendix to Report), shows that the planes of the circumferential cracks were inclined forward, the first slightly, the second at an angle

of nearly 45°, and the mean inclination of the plane of complete circumferential fracture still more. The mean distance of fracture on interior surface from breech end of bore being seventy inches, and of that on the exterior seventy-five inches. This inclination of planes of fracture is in accordance with the effect of contrary pairs of stresses,—thrust and tension,—and to such stresses the steel tube was subjected. From the relations of the lines of cracks and fracture, as shown in the development of steel tube referred to, it appears that the two cracks nearest the breech end of bore were formed first, as they are prolonged in the development across the circumferential line of complete fracture, and separate from each other pieces 2 and 3, as also 3 and a missing piece. The longitudinal line which separates pieces 2 and 1 does not cross, but ends at the line of circumferential fracture. It is probable, therefore, that this longitudinal line and the interrupted, short, transverse line separating piece 2 from pieces 5 and 6, with other lines of similar character separating smaller pieces, were formed after complete circumferential fracture; and that pieces 1, 2, 5, and 6 were formed from one piece after circumferential fracture. The indications are that the longitudinal line of separation between pieces 1 and 4, which terminates at the circumferential line, and at a transverse line of division forty inches farther forward, was also subsequently formed. But the longitudinal line which separates piece 4 from the missing piece, between it and 3, unites with the circumferential line, which, at the point of junction, turns sharply towards the breech along the right side of a groove to a point 67 inches from the breech end of bore, where, after crossing nearly at right angles one land and a groove, they diverge, the line of fracture recurving forward, the crack continuing transversely for a distance of 7½ inches. In this instance the longitudinal crack was probably formed before the circumferential fracture. It will be noticed, in the development of the gutta-percha impression before referred to, that all the clear rectilinear breaks are in the grooves along the *left* sides of lands, and that lateral extension to the right is shown to the amount, at 67 inches from breech end of bore, of .12 of an inch. Beyond this point the bore is irregularly fractured; but indications of greater lateral extension to the right are very apparent. It represents the torsion of the tube caused by the reaction, upon the lands, of the projectile in taking up rotation. Such reaction would be effective when combined with stresses producing strains during which molecular rigidity would be diminished. It appears, then, that prior to the complete circumferential fracture of the steel tube cracks were forming, the longitudinal parts of which may be traced from points about fifty-six inches from the breech end of bore to a second complete circumferential fracture about one hundred and fourteen inches from breech end of bore, and at the rear end of B tube. The mean direction of these cracks is nearly parallel to the axis of the gun. On inspection of "sections and

elevation showing fracture in breech portion" (see Appendix to Minutes, Plate No. 2), it will be seen that the stress which fractured the steel tube circumferentially and expanded the forward part of the breech-piece, extended to the 1 B coil. The breech-piece, compressed between the steel tube and the 1 B coil and C coil, being subjected to external as well as internal pressure, although strained and indented by the local pressure of portions of the steel tube, was not broken, while the 1 B coil, shrunk upon it, was fractured.

This fracture appears to have been due to stresses produced by local pressure of the expanded projectile on the steel tube, transmitted through the intervening mass, taking effect upon the exterior 1 B coil in planes corresponding to those of fractures of the interior tube, supplemented by the tension of the gases. The principal lines of fracture of the 1 B coil, with the exception of the first circumferential fracture produced by the joint action of gas and shell, are such as are caused by hoop-tension, tending to split tubes from end to end, and to longitudinal tension, due to change of form in bending; these lines intersect, or abut, at right angles. When the initial cracks, at 57 inches from breech end of bore, running transversely, were produced by shearing stress, as described, that stress was diminished by the yielding of the breech-piece, and hoop-tension prolonged the cracks, longitudinally, in advance of the surface upon which the greatest intensity of pressure was exerted. A corresponding increment of expansion of the shell attended by increased compression, augmenting the shearing stress, resulted in effecting the complete circumferential fracture; crossing the longitudinal cracks which preceded it. Simultaneously the gases obtained access to the interior cylindrical surface of the 1 B coil, and between the face of the breech-piece and the rear end of the 1 B coil. The effect of this gas-pressure would be to produce in the 1 B coil, upon which no external pressure is exerted except that by the forward end of the C coil, which overlaps it 10 inches, the usual hoop-tension, tending to split the coil from end to end, and to break it transversely by bending it outwardly. The effect of gas-pressure upon the rear end of the 1 B coil, at the face of the breech-piece, would be to produce shearing stress and longitudinal tension on that part of the 1 B coil compressed under the forward end of the C coil; and this stress would tend to take effect in planes previously or concurrently subjected to a shearing stress, indicated in this case, as before stated, by the correspondence of the planes of fracture with the planes of the initial transverse cracks and of complete circumferential fracture of the steel tube. The surface of fracture so produced would present the appearance described in the report: "The rear end of the 1 B coil remains in the groove provided for it between the breech-piece and the C coil, but only a few inches so remain, the 1 B coil having been fractured circumferentially all round in or near to the groove; the faces of the rupture are much abraded, and prove

that there was not any tendency to endway rupture, but that, on the contrary, the burst was one which acted radially, and did so while the parts were thoroughly pressed together endways."

The longitudinal tension would suffice to withdraw such part of the 1 B coil as would otherwise have remained in the groove, compressed between the breech-piece and C coil, the semi-circumferential fracture on the right side of gun being 5 inches to the rear of the face of the C coil, the fracture on the left side of gun at an equal distance forward of it. The sections and elevation, showing fractures in breech portion (Plate 2, Appendix to Minutes), illustrate very clearly the effect of local pressure and transmission of stress. It will be observed, in the elevation, that the circumferential fractures of the steel tube and 1 B coil may each be divided into two portions. One, of the steel tube, on right side of gun, parts of which are 12 inches in from the face of breech-piece, embraces an arc of about 103°; leaving 257° for the other. The corresponding fractures of the 1 B coil embrace, respectively, arcs of 200° and 160°; the former 10 inches, the latter from 1.5 to 3 inches in rear of the face of breech-piece. "At a point 69 inches from the bottom of the bore, and between grooves 4 and 8, there commences a smooth, bright mark, extending for about 6 inches. This mark seems to indicate that at this point the projectile was pressed strongly against one side of the bore, but there is no seizure or anything approaching to it." (See evidence of Captain Noble [c], Minutes of Proceedings.)

The remaining part of the steel tube at the face of this section of fracture is still in close contact with the breech-piece, excepting near its junction with the longitudinal line of fracture below, where there is a space of .03 inch between them. Immediately beyond this point close contact reoccurs, but at other points in the circumference the space varies from .03 to .08 inch.

The indications are those of local pressure. It is evident that this local pressure, producing greater compression of the 1 B coil between the breech-piece and C coil, would tend to increase the shearing stress as compared with hoop-tension in the 1 B coil on that side; while on the other, the shearing stress would be diminished and hoop-tension increased. The result would be that the lengths of concentric, corresponding arcs of fracture of the steel tube and 1 B coil, approximately in the same planes, would be inversely proportional. And such is the relation presented in this case.

We have now to consider the fracture of the forward end of the 1 B coil in connection with the steel tube and B tube. The latter, "hollowed out for a length of ten inches to embrace a projection on the front end of 1 B coil," subjects that projection to compression.

Referring to "development of steel tube showing different fragments" (Plate 8, Appendix to Minutes), it will be seen that the cir-

cumferential fracture at which the longitudinal lines of fracture of the steel tube terminate, is about one hundred and fourteen inches from breech end of bore, and at the rear end of the B tube. This indicates that the longitudinal pieces of the steel tube were broken transversely by the tilting outwardly of their rear ends before the B tube gave way, and that parts of the 1 B coil were turning about the rear end of the B tube as an axis. At that instant, while pressure was still exerted by the forward end of the 1 B coil, compressed under the rear end of the B tube, the projectile entered that part of the steel tube surrounded by the "projection" of the 1 B coil and the "overlap" of the B tube. That part of the steel tube not having been enlarged, being nearly in its normal state, necessarily opposed more direct resistance to the passage of the projectile than had been before opposed. Referring to "development of 1 B coil," Plate 9, "development of B tube," Plate 10, and to the "two views of steel tube, top and bottom" (Plates 4 and 6, Appendix to Minutes), it will be seen that the circumferential fracture of the 1 B *coil* occurred at the rear end of the B tube, 114 inches from breech end of bore, and that circumferential fracture of the B tube occurred at the forward end of the 1 B coil, between 122 and 126 inches from breech end of bore. A little to the right, on top of B tube (left of the gun), a number of small fragments indicate intense local action. With these fractures compare those of the steel tube, Plate 8: circumferential fracture occurs at 114 inches from breech end of bore, corresponding to rear end of B tube. Forward of this fracture, immediately under the point in B tube referred to as indicating intense local action, is the shoulder of the steel tube formed by the second reduction of thickness of tube from 3.5 to 2.5 inches. The fragments of the steel tube lying forward of the circumferential fracture one hundred and fourteen inches from breech end of bore differ in form from those which lie to the rear of that line. The latter, as well as the fragments of the surrounding 1 B coil, are generally rectangular. The fragments of the B tube are also generally rectangular, but those of the steel tube which it surrounds are triangular and rhomboidal.

The "development of bore" submitted by Captain A. Noble to the committee, represents the fragments as restored to place and, consequently, the general direction of lines of fracture, thus indicating the direction and kinds of stress which produced them. It will be observed that all the boundary-lines on the forward right sides of these fragments are, with a single exception, convex; that on the left rear sides they are concave. Such would be the effect of longitudinal compression combined with hoop-tension and right-handed torsion. The forces required to produce these stresses would be applied in the case of a cylindro-conoidal projectile entering a tube of less than its diameter. The torsional stress from reaction of the projectile upon the lands being greater than would be due to increasing twist, in consequence of the

interruption of continuity of "rifling" between the breech-piece and rear end of B tube.

Considering the relative positions of the 10-inch "overlap" of the B tube and the half-inch reduction of the thickness of the steel tube, five inches farther forward, and that the powder gases were acting upon the 1 B coil, tending to turn its forward parts upon the steel tube as a fulcrum, while there was no pressure acting radially within the steel tube in front of the projectile, nor between the steel and B tubes, the rupture of the 1 B coil permitting the gases to escape, the tendency would be to fracture by bending in advance of the projectile. The fragments rotating in the planes of resultant couples, their breech ends turning outwardly, their muzzle ends towards the axis of the gun. In this violent disruption and displacement of parts opposing more direct resistance to the passage of the projectile we should expect to find evidences of collision. Two fragments, Nos. 12 and 13, present such evidence (see Memorandum). They were the nearest of those recovered to that forward portion of the gun which was projected into the sea, and of which nothing more is known. The top view of steel tube (Plate 4, Appendix to Minutes) shows the relation of the lines of fracture and forms of fragments, but, in consequence of the large portion missing, not so clearly as does the bottom view, Plate 6. Comparison shows that the distribution of lines of fracture is in accordance with the stresses to which they have been referred. Preceding displacements within the forward part of breech-piece necessarily involved change in the direction of the axis of the projectile with respect to the axis of the bore, the rear end being deflected to the right, and the forward end to the left; and this would seem to have been one cause of the more violent action on that part of the B tube to which, in connection with the steel tube, attention has already been called. It is quite evident from the drawings that the general effect was so distributed; for while rupture of the steel tube within the breech-piece and of the 1 B coil shows greater displacement of mass to the right, that of steel tube in connection with B tube shows more violent displacement to the left.

The order of probable occurrence may be stated as follows: when the base of the shell arrived at a point sixty inches from breech end of bore, the forward end of cylindrical part of shell being twenty-four inches in advance, and eighty-four inches from breech end of bore, the first or initial cracks were formed on left side of bore, as is shown by their having been traversed by the circumferential fracture. The base arriving at a point sixty-six inches from the breech end of bore, circumferential fracture was completed, and simultaneously a longitudinal crack formed between pieces 4 and 1, while pieces 1 and 2, with piece 3, the rear ends of which were one-quarter of an inch thicker than their forward parts (in consequence of the transverse fracture having occurred

just in rear of the first reduction of the steel tube, forming a shoulder with a concave face), were pressed forward and under the 1 B coil; this action being facilitated by the inclination of the curved faces of the raised part on the rear outer surface of each. The effect of this wedging process would be to compress and abrade the rear ends of the fragments, to increase local pressure upon that part of the front end of the breech-piece upon which they were bearing,—impressing it,—and upon the opposite side of the bore farther to the rear, in consequence of the longer bearing of the projectile on that side,—the completion of circumferential fracture and the longitudinal division separating pieces 4 and 1. Increasing twist of "rifling" would tend to produce left-handed displacement of the fragments, and this, with the inclination of the abraded surfaces of pieces 1, 2, and 3, due to the local action of the projectile upon their rear ends when pressed under the rear edge of 1 B coil by the passing projectile, would make them appear, in the words of Major Owen,—

"As though compressed or ground by a circular or cylindrical body, the ends of these splinters towards the muzzle being, at the time of the action, tilted outwards." Or as described in the following paragraph from the report of the committee: "The abrasions on these three splinters are not such as could have been caused by the splinters having, after explosion, come into contact with any foreign substance, as they are regular and continuous abrasions, and show that they must be due to the passage over the splinters when in an inclined position after fracture of a projectile, which must of necessity, therefore, have been in the rear of the point of fracture at the time of the bursting of the gun."

There remain to be considered some incidental phenomena which, although interesting, are not essential to the hypothesis of a single charge.

It is noticeable that the longitudinal lines of fracture of the steel tube are nearly parallel to the axis of the bore, and do not exhibit that tendency, usually observed in fractures of rifled guns, to follow the grooves.

In those cases where the steel tube has "been known to have severe longitudinal cracks, arising from the gun being used in normal conditions, they have generally commenced either at the vent or at the base of the shot, generally running along the groove. With continued firing they generally extend in both directions; viz., towards the muzzle and the bottom of the bore."

In such cases there has been gradual yielding of the wrought-iron envelope with successive discharges, and as the depth of groove is considerable,—.2 of an inch,—the direction of fracture is determined by it. But with guns not strained by repeated firing, and in which the steel tube is well backed, the resistance of the envelope

united with that of the steel tube is virtually equivalent to a reduction in depth of the grooves, since the ratio of that depth to the thickness of metal actually resisting the bursting forces is reduced. In thick cast-iron rifles incipient lines of fracture usually follow the grooves, since the walls of the bore are not well supported, and the tendency to follow them is very great. In this respect they resemble the steel tube which, by repeated expansions in a wrought-iron envelope, has been deprived of initial support. In the instance under consideration, the pressure of the projectile, applied to the lands, would probably exert a controlling influence in directing the fracture. For the velocity of the projectile, due to the length of bore traversed, was sufficient to carry it from the face of the breech-piece through that part of the tube in which the longitudinal lines are nearly parallel to the axis of the gun, before the inertia of the 1 B coil was overcome by the action of the powder gases; and consequently, the steel tube at that part derived nearly if not all the initial support the 1 B coil would have given it had the powder gases not penetrated between them.

It was observed by Captain Noble that one of the fractures of piece No. 8 presented a very remarkable appearance, a portion of the fractured surface having been fused by the escape of the powder gases.

When a projectile is put in motion by the tension of the powder gases, work is done upon it in overcoming inertia, and heat, represented by equivalent mechanical energy, disappears.

A wedging projectile performs work in overcoming the resistance opposed by the walls of the bore and obstacles in its path, and that work is equal to the energy exerted in producing an acceleration of the same body equal to the retardation. The disappearance of this energy produces its equivalent of heat, divided between the projectile and the gun at their surfaces of contact; and this, with the combustion of more than the usual quantity of powder, in consequence of the retarded motion of the projectile, would be sufficient to produce appearances of fusion, as presented by the surface of fracture of the piece referred to.

A retardation of one hundred and fifty feet of the velocity of the projectile corresponds to the acceleration which, under normal conditions, it would have acquired in traversing a space of about one foot, after attaining a velocity of one thousand feet; and as the empty common shell, with "gas-check," weighs five hundred and ninety pounds, the energy transformed would produce two hundred and sixty-seven "pound-degrees" Fahrenheit. Assuming the specific heat of steel to be .114, and the melting-point 2500° F., this heat would be sufficient to raise the temperature of very nearly one pound of steel to that point.

The hypothesis of a double charge rests for its support upon the evidence given by the remains of the gun as interpreted by the committee.

Assuming that the explosion was due simply to high tension of the powder gases, the centre of effort was assigned a position near the centre of fragments,—that is, "just about the centre of the 1 B coil, namely, 90 inches from the breech end of the bore;" that "the splinters had been tilted into the form of a double cone, the bases of the cone being at the centre of explosion;" that the marks on the ends of splinters 1, 2, and 3, and on the forward ends of splinters 12 and 13, at the rear and forward parts, respectively, of this double cone were made by the projectile in front of which the explosion occurred. In the words of the report, "the committee will once more refer to the abrasion marks on splinters 1, 2, and 3 to show that the bursting took place in front of the projectile."

The high tension at the bases of the two cones was attributed to the compression of the inflamed charge of eighty-five pounds of powder between the projectiles.

In the plan—"showing the circumstances of the burst, made up from the present state of the gun"—handed in by Captain Noble (see Appendix to Minutes), the forward projectile is represented as passing through the forward end of the double cone, the forward ends of the tilted splinters in contact with that projectile about its middle part, whilst the second projectile is entering at the rear end, about two-thirds of its length being within the cone.

As remarked by the committee, "If it (the second projectile) had struck any of the splinters of the steel tube forward of the centre of the burst, it would have made marks on those splinters agreeing with such a condition of things."

But, if such was the condition of things, it can hardly be supposed, if the explosion was caused by high tension of gases between the projectiles, that splinters 12 and 13, formed at the rear part of the first, or forward, projectile, could have remained in position to be struck by the second. Upon the assumption that the marks referred to were so made; upon the finding in the turret of a doubtful stud, referred to as evidence "given for what it is worth," and upon the violence of the recoil,—rests the hypothesis of a double charge, so far as the evidence given by the remains of the gun is concerned.

If it could be shown, that on firing a preceding electric broadside only two shot were seen to strike the water, the inference would be that a charge remained in the gun; and that a second was subsequently added.

There were aloft, Sub-Lieutenant Frazer and five men, watching the practice. One of the men, a signal-man of the third class, who had glasses, but did not use them, saw two shot strike the water; and thought he would have seen a third had it been fired.

A second said he saw but two splashes; there might have been a third; had it been near the target he would have seen it.

Two saw two shot strike the water, but would not say there might not have been three; as on former occasions one of them had seen two shot make but one splash, and the other had seen four shot make but two splashes.

The fifth man saw three shot in the *air*, and saw them strike the water.

Captain Chatfield and Sub-Lieutenant Frazer used glasses; they saw three shot strike the water; the latter said, "I distinctly saw the three shot *in the air*, just before they struck the water, through my field-glasses."

The glasses used on such occasions are the well-known Galilean telescopes,—opera-glasses. Having large object-glasses they receive much light, of which, as there are but two lenses, little is absorbed. They give, therefore, very distinct images. At four hundred yards, the estimated distance of the target, they should be found, in such work, efficient aids. "But at so near a range as four hundred yards, in the opinion of the committee, persons not using glasses are more likely to be able to form an accurate judgment than those who are restricted to the limited field afforded by a glass." As in this instance the three shot were seen *in the fields* of their glasses by both observers, less weight may be attached to the opinion of the committee than that to which, under other circumstances, it might be justly entitled. We must take into consideration also the fact that those who used the glasses were naval officers, trained to habits of comprehensive and accurate observation, and governed by a due sense of responsibility. Had the signal-man used his glasses he might also have seen the shot in the *air*, and have resolved one of the two splashes, which he did see, into two. Sub-Lieutenant Frazer, who had been performing the duty of watching the target practice from the "Thunderer," and registering the results, for fourteen months, states that *two* shot "from the foremost turret struck the water about thirty yards beyond the target, and about eight yards to the left of it. The shot from the after-turret struck the water about twenty-five yards beyond the target, and about four to the right of it." It is therefore evident, and yet not a matter of surprise, that the two splashes made by the two shot from the foremost turret, from two guns in all respects alike, similarly pointed and simultaneously discharged by electricity, were so near each other as to be readily mistaken for one,—a coincidence which had been observed in preceding practice.

The very short time of flight of the projectile to the target—less than a second—gives rise to a doubt in the minds of the committee as to the accuracy of observation of those who were watching the practice through glasses. If the observers were actually "watching," the shortness of the interval would present no difficulty: experiment has shown that the duration of a visible electric spark may be less than $\frac{1}{24000}$ of a

second. The interval during which a column of spray would be visible if it attained a height of but sixteen feet would be two seconds, which added to the time of flight gives nearly three seconds for the complete transaction. But if the time was short, the consequent difficulty would, seemingly, serve but to explain a failure to see.

Of those who were in the turret when the explosion occurred but one survived,—William Caswell, captain of the mizzen-top and No. 2 of the gun's crew. He states that at the instant of explosion he "was standing at the left rear of the gun, facing the gun," that "it recoiled in about half-way; it was then run back to the loading position by No. 1 with the hydraulic." The capacity of the witness was shown upon cross-examination as follows: "With regard to your answer (354) you mean, do you not, that you knew the gun had fired because you saw it moving back past you?"

"Because I saw it *recoil*."

"If it had been moving back, as at drill, when run back by hydraulics, would it have appeared to you much the same?"

"No."

"What would have been the difference?"

"She would have been faster in recoiling."

It is evident that the witness did not confound the motion of *recoil*, characterized by high initial but rapidly-decreasing velocity, with the sluggish start and increasing velocity of an hydraulic running-in.

Captain Chatfield had, upon examination, stated that "the difference between the recoil on firing a shot and the motion of the hydraulic running-in is so great that no trained man or officer could possibly mistake one for the other."

Caswell, having before stated that No. 1, whose duty it was to attend the hydraulic lever, was standing by it, but did not have hold of it, was asked: "Does No. 1 of the gun generally move his hydraulic lever to run the gun in as soon as ever it has gone off, or does he wait to see how far the gun will come in by the recoil before he moves the hydraulic lever to complete the running in?"

"He would wait to see how far the gun recoils before using his lever to complete the running-in. This is the practice. The gun would have recoiled by the time he could have put his hand upon the lever."

The fact that, in drill before the committee with an empty gun, No. 1 of the gun's crew did reverse his lever at the instant of explosion of the tube, to run in a gun which he knew could not recoil, can hardly be regarded as sufficient to sustain the opinion that Caswell, seeing the gun moving back past him under hydraulic pressure, fancied that he saw it recoil in about half-way, and, then, saw it run back to the loading position by the hydraulic.

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THE BATTLE OF NASHVILLE.—GENERAL GEORGE H. THOMAS.

BATTLES were fought so rapidly during the war that time was not given to our people to discuss and fully understand one before another would be fought and claim attention. The battle in front of Nashville was so soon followed by the surrender of the rebel forces, and our citizens were so much rejoiced at the prospect of peace, that they failed to give it the prominence it deserved and is destined to have in the history of the country. In July, 1864, the Confederate cause was fast failing for the want of a more vigorous prosecution of the war, and General Hood, known to be a brave and dashing officer, was selected as the proper person to inaugurate a new policy by assuming the aggressive. Several hotly-contested battles delivered in front of Atlanta elevated him to a high position in the estimation of the Southern people, and the entire South was filled with his praise. The battle of Jonesboro', finally, sealed the fate of Atlanta, and it fell into our possession. Hood saw that his army was fast disappearing by being driven at every point, and, despairing of inflicting any serious damage to Sherman's army by direct conflict, resolved on an attempt to accomplish by strategy that which he had so signally failed to accomplish in the battles of July 20, 22, and 28. A campaign into Middle Tennessee was projected, and hailed with delight by his men, as some of his best troops were from that State, and they hoped to reach home once more; and the people of the South were rejoiced beyond measure, as by this policy on the part of General Hood it was hoped that the seat of war would be removed far from them. Middle Tennessee was invaded, but the object of invasion failed, and the praise that had been showered upon Hood was changed to abuse of the most bitter character.

Let us look at his campaign in the light of probable success. General Sherman had started on that eagle swoop of his to the sea, taking with him the greater portion of his grand army, which had been pushing Johnston and Hood all summer. Thomas was left in Tennessee with a small command, and everything seemed favorable for a successful invasion of that State, the capture of Nashville, and even the planting of the Confederate flag on the banks of the Ohio River. The Union cause would have been seriously damaged by the capture of that city,

with its immense stores of provisions, clothing, camp and garrison equipage, to say nothing of the large quantity of artillery, small-arms, and ammunition which would have fallen into the hands of the enemy, supplying a want so seriously felt by him. The chances of success were so much in Hood's favor, and, if successful, so fraught with advantages, that I can readily understand why he attempted it; and, in my opinion, it was the only course left to him. He crossed the Tennessee at Florence, and slowly and cautiously approached Nashville. At Franklin Schofield dealt him a heavy blow, but he soon rallied and followed on, and on the first day of December he formed his lines around Nashville. Here he remained inactive until Thomas organized his forces. It was a fortunate circumstance that Sherman left in Tennessee a man of energy and ability, a man in whom all had confidence, —Major-General George H. Thomas,—for upon him rested a weighty responsibility. His defeat would have prolonged the war for years. Hurriedly Thomas gathered his scattered forces and prepared for a bloody conflict. Not one of his generals doubted the final issue. When he called them around him on the night preceding the battle, and gave each his instructions, they knew that he was fully equal to any emergency; they knew that before the sun went down on the following day Hood and his army would be in full retreat.

His order for battle was a full report of what was done; no word of explanation was necessary. He ordered; it was obeyed. His hastily-organized army was to be hurled against Hood's veteran army, composed of as good soldiers as ever shouldered muskets. All arrangements having been completed, the attack was ordered to take place on the morning of the 15th of December. A dense, heavy fog that hung over the two armies delayed the attack for some hours, but when the sun came out and the mist disappeared, arrangements were soon perfected for the final struggle. At a given signal the artillery opened fire, and for twenty minutes or more the brazen-throated dogs of war belched forth fire, shot, and shell into the enemy's works.

Then the order "To CHARGE" was given to the cavalry on the right, and like magic it passed from right to left, and soon the whole army was engaged. The Confederate veterans fought with desperation, but gradually the "banner of glory and of beauty" advanced; the contest became frightful; the dead and dying were strewn upon the field. A shout was heard,—'twas victory! and victory! victory! was the answering shout of every patriot on the battle-field, from Wilson's cavalry on the right to Steadman's dusky sons of Mars on the left.

The stars and stripes were planted upon the enemy's works, and Hood, with his army, was in full retreat, followed by the victorious army of the Union.

That victory saved the capital of Tennessee from the hands of the enemy, and hastened in a very great degree the termination of the

war, which soon after burnt itself out amid the black ashes of overthrow and defeat. In its design and execution the battle was a masterpiece of military skill and ability. Its plan was faultless, and the general whose peerless wisdom projected it had the consummate skill to accomplish it in all its details, from the opening volleys on the right, where the cavalry bore the national flag up to the very entrenchments of the enemy, and breasted the hurtling storm of lead and flame and steel, to the awful tempest of death which rained its torrents of blood upon the quaking breast of Overton's Hill, and shook the forest with its deafening, maddening roar. After a vigorous pursuit of several days the remnant of the fine and defiant army that Hood brought into Tennessee sought safety on the south bank of the Tennessee River.

This was the last staggering blow at the failing Confederacy, and contributed in a large degree to the success of military operations in the East. Had it terminated differently, the Rebellion would have received a new lease of life, and other and bloody campaigns would have been the legitimate consequences. Richmond would have been reinforced, and the rear of Sherman's army would have been endangered, while but a flimsy line of thin outposts would have intervened between the rich cities of the Northwest and Hood's needy and desperate squadrons. But it was not in the nature of things that it should terminate differently, for that "man compact of genuine stuff," that "completely rounded, skillful, judicious, modest soldier," that wise, calm, self-poised, steadfast chieftain who had "plucked up drowning honor by the locks" at Chickamauga,—the hero of the Cumberland stood like the very embodiment of victory in front, and competition and overthrow shrunk backward from his path.

Not, perhaps, in all the history of authentic war is there another case where the besieged, gathered as was this command, in this instance, on the spur of the occasion, from every direction, detachments, raw recruits, drafted men, new regiments, with the old Fourth Corps and its brave young brother, the Twenty-third Corps, as the nucleus of organization, throwing down every barrier and laying aside every artificial defense, rushed out upon an overnumbering foe, versed in all the strategy of war, and beat him face to face and front to front in fair and open contest. What Hannibal failed to do at Carthage and Marc Antony failed to do when he sallied down to Actium to meet the young Octavius, was reserved for Major-General George H. Thomas to do at Nashville. Never was victory more complete, or defeat more crushing and overwhelming. Hood's army was literally and actually broken up and destroyed, and its usefulness as an effective military organization ruined effectually and forever. Sennacherib's host scarce melted away more completely. The victorious army at Nashville, conscious of the mighty issues at stake, emulous of its high name, enthused with the knowledge of its great leader's presence and guidance, mindful of the

fact that his name and the name of defeat were antagonistic terms, fought only for victory, and won and wore its honors as matters of inherent right.

The battle of Nashville will take its place in history as one of the most decisive of the war, and the name of the gallant leader who planned and executed it will never be forgotten so long as loyalty, truth, and honor are revered and respected by the loyal people of America.

R. W. JOHNSON,
Brevet Major-General U.S.A.

IN MEMORIAM.[1]

OH, English hearts that yearning,
To this far land are turning,
  Mark, mark these sacred hours,
And let your tears be shed!
Upon the damp ground lying,
With palms above them sighing,
  'Mid tangled vines and flowers,
Behold two heroes dead!

Through savage armies cleaving
Their way,—behind them leaving,
  Amid the surging masses,
Despair, and nothing more!
Like stricken eagles flying,
Wounded so sore—and dying,—
  Through blood-bedewed grasses
Their precious flag they bore;

[1] At Isandula, when overpowered by the Zulus, the English general, or colonel of the regiment, commissioned two of the young lieutenants to save the regimental colors. After cutting their way through countless hordes of Zulus, who pursued and wounded them, they succeeded in gaining the rapid river and swam their horses across. Wounded and exhausted, they lay down to die, and when a party of soldiers from Natal arrived in search of them, they were found dead on the bank, with their colors saved around them.

With black foes round them seething,
At last their sabres sheathing,
  With courage high abiding,
They took the desperate leap!
On the further shore we found them,
Their colors *saved* around them,—
  Ended their fearless riding,
Wrapped in an endless sleep.

No sound of woman's weeping,
But on the river sweeping
  Past, with a strength enduring,
Mysterious, sublime!
There seems a music falling
Of dreamy voices calling,
  To gardens all alluring
Beyond the Sea of Time.

Aurora's softest blushes,
Incoming through the rushes,
  With dewy gems of morning,
Create an aureole;
As though a form from heaven
Had kissed their brows and given
  With saintliest adorning,
A God-speed to the soul.

Ah, maiden, save your roses!
A laurel-wreath reposes—
The crown of the Immortals—
  Upon each knightly brow.
Boldly they knocked and entered
Where every thought had centred,—
  And they are glory's now!

T. H. STEVENS,
Lieutenant U.S.N.

U S. S. "RICHMOND," Arabian Sea, April 3, 1879.

A CHAPTER ON PERU. LEAVES FROM A CAPTAIN'S LETTER-BOOK.

THE suicidal course of rule and government which obtains in most of the republics of Central and South America is being forcibly illustrated in the war now raging between Chile, Bolivia, and Peru. In the case of Peru it is difficult to conceive what is to be her status as an independent state at the conclusion of the present struggle, for at the present moment she is bankrupt. A late cruise on the South Pacific coast has given the writer an opportunity of investigating the causes that have led to this result, and it may not be uninteresting to the readers of this magazine to review with him some of the "leaves from his letter-book."

Peru is very rich in natural resources, and, notwithstanding the many faults of commission and omission perpetrated through a long course of years, these had preserved her credit unimpaired until very lately. She has now fallen from her high estate; the collapse has been very sudden, the causes are not remote, and we propose to trace them.

Peru has existed for many years in a normal state of revolution. Certain leading men choose to consider themselves as the natural guardians of the state, and these, divided by party lines, keep the country in a constant state of excitement. It is a remarkable fact that the Peruvian gentleman is seldom found in business as a merchant. His education is for the law, and his career is politics. The merchants in Peru are mostly foreigners, and the banks are controlled by foreign houses. The developers (so far as they are developed) of the agricultural and mineral resources of the country are foreigners. It is foreigners who raise the cotton, who cultivate the sugar-cane, who export wool and hides, who work the mines and nitre-beds, and who reduce the ores, and it is this element in the population which gives what stability there is to society and to the useful institutions of the country. Foreigners are now found occupying positions in local boards and in city councils, thus giving aid in municipal affairs; and in times of revolution it is the money of the foreign merchant which pays the troops during the struggles of parties for the possession of the government, thus insuring order and protection to property, which could not

be rendered if the soldiery were to disband and to take sides with the different candidates.

Whatever party is temporarily in power must have control of the troops, and these cannot be held together for a day unless their pay be secured to them; hence the necessity of money, without which the success of a revolution is impossible. In such cases the foreign merchant is appealed to for a loan. Care is taken not to demand money as a forced loan, for treaties preclude such a course, but the merchant is made to see that without money the preservers of order will disband, and that chaos will be inaugurated; so, for self-preservation, he is constrained to supply funds, trusting to being reimbursed on the success of the party.

The guano deposits of Peru have for many years acted as a powerful stimulant for exertion on the part of the contending factions to possess the government. The ease with which this valuable fertilizer could be collected, and the rapid manner in which its value could be realized, has for years dazzled the eyes of contestants for place; it was a more sure source of wealth than gold mines, and as long as there seemed to be no limit to the supply, no serious thought was entertained by the government of developing the mineral or agricultural resources of the country. But at last, like spendthrifts, they found that they had been living on their principal; that the great wealth of the Chincha Islands was exhausted; that they could no longer depend on this ready means of raising money for the state and wealth for office-holders; and it became necessary to look around for other sources from which to draw means for the support of the government.

Up to the time of the exhaustion of the guano deposits on the Chincha Islands, the credit of the government of Peru was perfectly sound. Peruvian bonds were considered a good investment, and perfect confidence was entertained in the integrity of the government, and in its ability to fulfill all its obligations. This state of affairs existed up to a very few years ago. Peru is now bankrupt! This sudden collapse is unique in history.

With the failure of the deposits on the Chincha Islands, the government of Peru had before it two sources of wealth from which to draw, each of which required time and money to develop. These were agriculture and mining. The soil of Low Peru, that portion of the country which is generally referred to as Peru, signifying the land extending from the sea to the foot of the Cordilleras, has all the appearance of a desert, but it possesses in itself fertilizing elements which, when called into action by water, make it the most productive of all soils. The germ of life remains in it, ready to assert itself on the slightest provocation. This is sufficiently apparent on the banks of the few streams which, flowing from the mountains, meander along the country until lost in the soil before they reach the sea. No rains fall over this region of country, and in the so-called dry season, when the

beds of the rivers are uncovered, these are planted with vegetables, of which a large crop is raised, sufficient to last until the next season for planting. This peculiar soil requires irrigation, and this was one means that was open to the government in planning a method to develop the resources of the country. There would have been nothing new in the idea, and it could hardly have been regarded as an experiment, for the wise Incas had, years ago, fed their people by these means, and the wrecks of their great works still exist to show to the modern civilizer how far he is behind his predecessor in his knowledge of what constitutes a solid basis on which a country must stand. A country that neglects agriculture, and that cannot feed its people, must be dependent on others. Peru refused the course that would have made her independent, and embraced the more glittering temptation held out to her in the development of her mineral treasures.

The mines of Peru have been worked, more or less, from the earliest days of which we have any history of the country. Anterior to the occupation of the land by the Incas we have only tradition to inform us, but the precious metals were used by the Incas in large quantities for purposes of ornamentation, and it was the value of these treasures that nerved the arm of the Spanish conquerors to achieve their deeds of daring. The work of mining has been continued to the present day, but it has never been developed to a large degree, in consequence of the distance of the mines from the coast, and of the difficulties of transportation. The expense attending the working of the mines is also immense, in consequence of the desert character of the country, which makes it necessary to transport from the coast even the daily food required to support the lives of the employees. At short distances from the few small streams water is rarely found that is fit to drink, and even on the coast fresh water is produced by condensation. Droves of mules and donkeys, imported by the Spaniards, traverse the land to and from the mines like fleets of the desert, and much time is consumed in a voyage of these caravans. The price of labor is low, but animals are very valuable property. When a balance is struck between expenses and receipts the margin of profit is not large. The chief operators in mining, as in all other industrial pursuits of the country, are foreigners.

The method decided upon by the government to develop the resources of the country was to inaugurate an extensive system of railroads, in order to aid in the transportation to and from the mines, and to induce immigration to the rich valley beyond the western Cordillera, which is but sparsely settled by Indians. It is from the moment when this decision commenced to be acted upon that the present financial condition of the country dates. The names of Colonel Balta and Mr. Henry Meiggs are inseparably linked with this turning-point in the history of Peru.

It was at the time of President Balta's accession to power, in 1868, that it was made known publicly that it was the intention of the government to institute a railroad system for the purpose of developing the interior of the country, and of affording transit to the coast for its resources. It was determined to make the work a government work, and at the end of the year 1868 President Balta made his contract with Mr. Meiggs for the building of the following railroads:

PERUVIAN RAILROADS.

Contracted with Henry Meiggs.

Names.	Miles.	In Bonds. Soles.	In Cash. Soles.
Mejia to Arequipa	107	.....	12,000,000
Juliaca to Cuzco	212	.....	25,000,000
Chimbote to Huaraz and Recuay .	172	.....	24,000,000
Pacasmayo to San Pedro and Guadalupe. Calasñique to Magdalena .	93	5,000,000	2,100,000
Ilo to Moquegua	63	6,700,000	5,025,000
Arequipa to Puno	217	32,000,000	25,280,000
Callao and Lima to Oroya . . .	145	27,600,000	21,804,000
Total	1009	71,300,000	115,209,000

The funds for this enormous expenditure were raised by foreign loans, which were readily negotiated, as up to this time the credit of the country was good. Messrs. Dreyfus & Co. became the agents of the government, and a certain amount of guano was hypothecated. Work was commenced on the roads, money became plenty, corruption set in, enormous sums were squandered, a ruinous course of extravagance was run, and Peru found herself in 1876 with a foreign debt of thirty-seven millions pounds, with an annual charge of five per cent. for interest and two per cent. for sinking fund, or together equal to about two millions five hundred and ninety thousand pounds; also with an internal debt exceeding one million pounds.

The budgets for 1871 and 1872 combined show an average annual revenue of five millions eight hundred and ninety-eight thousand three hundred pounds, and an average expenditure of five millions seven hundred and ninety-one thousand four hundred pounds. From this exhibit some idea may be formed of the financial condition of the country.

The government of Mr. Pardo, which came into power in 1872, at the bloody termination of the Balta rule, had difficulties with Messrs. Dreyfus & Co., and, being in want of money for current expenses, raised funds on guano security from the Société Générale in Paris, which enabled it to pay the interest due on bonds to the end of June, 1876; and arrangements with the house of Raphael, Raphael & Co., of London, have supplied money later for most pressing necessities of the government: but the payment of interest on bonds has ceased, and

work on the railroads has been discontinued. Some of the roads are completed, but they yield no revenue to the state.

The government has also declared the nitre-beds of the country, their working, and the exportation of the nitre a government monopoly, and has from the 15th of January, 1876, taken possession of most of them, promising to pay a valuation to the owners. It has also put a duty on private exportation so high as to make it prohibitory, with the object of forcing all owners of this valuable article to surrender their lands at government valuation. The above presents, in as concise a form as possible, the financial condition of Peru; the political phase of the country is not more encouraging.

The frequent recurrence of revolutions, and the effort to retain the military simply as the preservers of order and the protectors of property, has led to an anomalous condition of things which obtains at elections. By legal enactments the police and military are forbidden to approach the polls, on the ground that opponents to a government candidate might be debarred from voting. It results from this that for the possession of every voting-stand there is a bloody struggle between the partisans of the rival candidates, and these must be supplied with arms and money; in fact, they constitute an armed force under the command of their respective leaders, and no candidate for office has any chance for success at an election who cannot raise money to meet this demand.

The election of Colonel Balta in 1867 was no exception to this rule, and much money is known to have been expended. It is cited as a coincidence that, at about the time of the election of Colonel Balta, Mr. Meiggs was engaged in winding up his business in Chile, where he had been a successful contractor for railroads, and made his residence in Lima, Peru; and the award of the contracts to him for the construction of the Peruvian railroads has led to the supposition that any efforts that he may have made in favor of the election of Colonel Balta were not disinterested. After receiving the contracts for the roads, Mr. Meiggs became a great power in the state, which he continued to be until his death. He has been styled the Railroad King.

During the presidential term of Colonel Balta he and his ministers, partisans, etc., became enriched. Abundance of money gave a show of prosperity to the country, and it was thought that President Balta would be able to complete his term of office (four years), which would have been an exceptional circumstance in Peru; but after the election of 1871 had resulted in the choice of Mr. Pardo to succeed Balta in the following year, a revolution was inaugurated by three brothers Gutierrez, who, having control of the troops, put Balta in prison and assumed the government, one of the brothers being styled Dictator.

The revolution, though for the time successful, could not sustain itself; the friends of Balta were powerful and rich, and were opposed

to the change; the troops were bribed, and many were induced to drop off from their allegiance to the revolutionary government, and the indignation that was felt against the family of Gutierrez began to show itself. Finally, one of the brothers was shot at the Callao railway station. This act was avenged by the remaining brothers, who with their own hands assassinated President Balta in the prison where he was confined. This act of barbarism so infuriated the populace that the inhabitants of Lima rose *en masse*, and, seizing the two brothers, hanged them from extemporized scaffolds projected from the roof of the Cathedral. The bodies were afterwards cut down and burned in the public square of the city.

A striking illustration of the danger arising from a want of unanimity in the action of the troops occurred during the Gutierrez revolution. The troops are the real preservers of order, and it has been shown that the foreign merchants are so well aware of this that they do not hesitate to subscribe money in times of excitement for the purpose of preserving intact this armed police, which alone can insure protection to life and property. In the short period embraced in the Gutierrez tragedy events followed each other so rapidly that the worst features of a revolution were being enacted before it was apparent that such a crisis was imminent, and the troops, confused between their duty to the government and their obedience to their officers, were found on different sides, arrayed against each other. A collision occurred in Callao, where one party held the forts, while the other party occupied the city, in which for several days chaos reigned supreme. Whatever was needed for the wants of the soldiery was seized, shops were sacked, and indiscriminate firing in the streets kept the people close prisoners in their houses. Many residents left the inhospitable shore and went afloat for safety, and the men-of-war of foreign nations and merchant vessels in the harbor were filled with refugees who had abandoned their property, and who sought protection for life alone. Such a state of affairs has seldom obtained, but it is likely to occur at any time, if the cohesion of the military be disturbed. In the instance under consideration, the subsequent outrages committed by the Gutierrez brothers so infuriated the populace of Lima that their spontaneous action repaired the error that had been committed in neglecting to provide against a separation of the military force, and the moral effect of the action in Lima, together with the death of the instigators of the rebellion, restored order in Callao.

This occurred in 1872, near the time when Mr. Pardo would have regularly succeeded to the presidency. This gentleman was summoned to Lima, and assumed the government, his advent being hailed with every demonstration of joy. Patriots who were truly interested in the progress of the country congratulated themselves and each other on the character of the man who, in this moment of anxiety and doubt, was

called to direct the ship of state. As far as it is possible to unite parties in Peru, they were united at the time of the commencement of the rule of Mr. Pardo; unlimited support was given to him, and he was a sufficiently able statesman to establish himself, at an early day, in his office so firmly that his influence continued to preponderate over all that could oppose him to the last day of his presidency. The general voice of the conservative people of Peru sounded the praises of Mr. Pardo. Whatever of embarrassment now weighs upon the country cannot be charged to him. He was not concerned in any way in the negotiation of the ruinous loans which have impoverished the country, and he did all that man could have done under the circumstances to palliate the evil. It is claimed that in the many points that were raised between urgent claimants and the government, he showed great judgment and ability in repressing their rapacity, and in a most determined way guarded the interests of the state.

A serious revolution occurred during Mr. Pardo's administration, and it is asserted that much of the money to bear the expenses was contributed by claimants on the government, in hopes of removing him from office. These assertions cannot, of course, be proved to be true, but it is equally impossible to prove their falsity. The revolution was headed by a Mr. Pierola, who is recognized in the country as a standing revolutionist, always ready to take advantage of an opportunity, and always sustained by the Church party; in fact, he is the leader of the unprogressive ultramontane party in Peru. The revolution was inaugurated by the arrival on the coast of an English steamer, called the "Talisman," which had been armed and equipped and loaded with ammunition in England. The character of her mission having been discovered, her captain, an Englishman, who had gone on shore in one of the small ports on the coast, was seized and detained by the authorities, and the "captain of the port" went on board to seize the vessel; but, on his arrival on board, the "Talisman" put to sea, carrying him off as a prisoner. The landing of the arms and ammunition took place at a small anchorage near the terminus of the railroad to Arequipa, at which place the headquarters of the revolution was established.

In this crisis Mr. Pardo acted with great energy and promptness. Several vessels of the navy scoured the coast in search of the "Talisman," while the president, with all the troops that he could raise, embarked in steamers and moved rapidly to the scene of action. The "Talisman" was discovered, and was captured by the "Huascar," commanded by Captain Grau (whose later actions have added to his well-deserved fame), but not before she had succeeded in landing the greater part of her cargo. The revolutionists, being thus equipped, were able to make a formidable resistance, and when the government troops arrived, under the command of President Pardo himself, the

fight was obstinate and bloody, resulting, however, in the discomfiture of the revolutionists, whose leader, Pierola, escaped to Chile.

The assassination of President Pardo was attempted on one occasion. The would-be assassin fired a pistol at him while passing from the palace yard to his carriage. The ball missed its mark, and the culprit was quickly captured, but the president magnanimously gave him his life.

The above statement of the political occurrences since 1868 brings us to the time of the accession to office of General Prado, elected to succeed Mr. Pardo as president in 1876. General Prado was considered as the government candidate, and, notwithstanding a strong opposition ticket headed by Admiral Montero, he was elected by a large majority, who looked forward to his presidency as a continuation of the beneficent rule of Mr. Pardo.

There was also a certain prestige attached to General Prado at this time from the fact that he had just returned from Europe, where he had made successful negotiations with the house of Raphael, Raphael & Co., in London, to supply the government with funds on which it depended to defray current expenses. The monetary condition of affairs at this time was as follows: there was still due to the late fiscal agents of the government, Dreyfus & Co., some hundreds of thousands of tons of guano, the delivery of which would not be completed until 1878. During this interval the government was bankrupt, without means to pay either interest on debt or to meet current expenses. The house of Raphael, Raphael & Co., on the security of two million tons of guano hypothecated to them, agreed to supply the government with seven hundred thousand pounds per annum for four years from 1876. It was expected that before the termination of the third year (1879) some returns would begin to be rendered to the new agents from the sale of the guano, and that at the end of the fourth year a sum might be accumulated with which to pay accrued interest on bonds. In the mean time, the effort to realize from the nitre-beds was continued by the government. This arrangement had been indorsed by the bondholders in France and England, and, though the terms were hard, there seemed to be no better way by which they could hope to get any interest on their money.

Having completed these arrangements abroad, General Prado returned to Peru, and on the 2d of August, 1876, the term of Mr. Pardo having expired, the new Congress decided that General Prado was elected to fill the office of president, and he was inaugurated in accordance with constitutional requirements.

During the electioneering campaign, General Prado was supported by the government, and the principles of the Pardo government were supposed to be identical with those of the Prado faction; but, notwithstanding the community of principles, that of interests did not har-

monize. Had Mr. Pardo been eligible for a consecutive second term of office, there is no doubt that he would have been the president elect, but, by the constitution, he was not eligible until a later canvass. He was, without doubt, the strongest man in the country, and was generally regarded as the most able. Thus it was that the new Congress, just organized, was made up of men who were more Pardist than government supporters. In passing on contested elections of members, the favor was always given to the personal friends of Mr. Pardo, even to the exclusion of those bound to General Prado by the strongest ties, private or public. The army was officered by men who were all Pardistas, the judges on the bench were all Pardistas, and the Congress was Pardista almost to a man.

This state of affairs was recognized as existing before the inauguration of General Prado, and it excited much comment. The solid front of Pardistas seemed to bode no good to the Prado administration, and it began to be questioned whether the inauguration of General Prado would really take place; the expectation was that a revolution would be declared for the purpose of keeping Mr. Pardo in office. These fears, however, were not realized; General Prado received the scarf of office from his predecessor, and the new Cabinet was formed. Thus there was a new president and Congress elected on a community of principles, but ranged in antagonism of interests. The name "Civilistas" was given to the members of the party representing the Pardo faction. An explanation of the origin of this name is necessary for an understanding of the embarrassment which weighed upon the government.

Until the election of Mr. Pardo, in 1872, the incumbent of the office of president had always been a military man; none but military men, either of the army or the navy, had been presented as candidates for the office, and when Mr. Pardo was put forth and elected, in 1872, it was supposed to inaugurate a new order of things. The name "Civilistas" was adopted at that time by the members of the Pardo party, and the name was revived when this party found itself in antagonism to the government party pure and simple.

The president, being indebted to the late government for his election, endeavored, in the formation of his Cabinet, to combine with his own preferred ministers a certain number of "Civilistas." It was at once seen that this middle course did not suit the Congress. A caucus of Civilista members was called, and strong condemnatory resolutions were passed reflecting on those members of the Cabinet who were not "Civilistas."

This state of affairs was sufficiently annoying to the president himself, but to his personal adherents it was intolerable. The president was so hampered that he could not reward his personal supporters, and these, looking upon office as their right, grew loud in their complaints.

The dissatisfaction of the Prado faction increased daily, and several public meetings were held in Lima, where the wrongs of the faction were presented in speeches. These so aroused party feeling as to cause, on the 20th of August, 1876 (only eighteen days after the inauguration of the new president), a serious disturbance.

A meeting was being held in the Plaza at Lima, at which an orator was reciting the objections that had been raised to the president's nominee for secretary. The meeting was held in the neighborhood of the "Union Club," and at a point of the oration hisses were heard from the club-house. The crowd immediately tore up the stones from the street and commenced an attack on the club-house, destroying the furniture and wrecking the rooms. The mob then proceeded to the office of the *Comercio*, a Civilista newspaper, which they gutted in like manner. An advance was then made in the direction of the private residence of Mr. Pardo, but by this time the troops had been called out, and on the arrival of the mob at the house they found it defended. Some firing took place, and five or six people were shot.

This riot became the subject of heated discussion in Congress, where the blame of the catastrophe was charged on the members of the Cabinet who were not "Civilistas," who, it was held, had encouraged the revolutionary spirit of the mob. These members of the Cabinet sent in their resignations to the president, who, though declining at first to receive them, was constrained finally to accept those of the most objectionable ones. This judicious yielding on the part of the president had the effect of quieting the excitement; the military preserved order, peace was thus established between the government and the "Civilista" Congress, and legislation of a conservative character was carried on, the Congress and the president seeming to work harmoniously with the view of reducing expenditures, and of assisting in the restoration of order and prosperity.

Some time subsequent to this restoration of peace the country was startled by a brutal act committed by a non-commissioned officer of the guard which was stationed at the hall of Congress. Mr. Pardo, who was a member of the Senate, was assassinated while passing from his carriage to the door of the hall. Peru was thus deprived of one of her most able and patriotic citizens. The cause of the deed is not known, but the act was universally deplored.

In October, 1876, a revolution was started at Arequipa by the irrepressible Pierola, which was promptly suppressed, but not without entailing expenses on the government which it could ill afford.

Pierola was again heard from during the past year, his movement at that time being inaugurated by the capture of the Peruvian turreted vessel "Huascar," the most formidable vessel of the navy, in the harbor of Callao, from which port she steamed out in broad daylight. Pierola joined her at the first port at which she stopped; then came an

engagement with the small squadron of two British men-of-war, under Rear-Admiral De Horsey, and her subsequent surrender to the Peruvian men-of-war sent in search of her.

One result of this fiasco was a difference with the English government, with which power the affairs of Peru were already sufficiently complicated in consequence of the treatment by the Peruvian government of the captain of the "Talisman," an Englishman, whose capture on the coast has been referred to before.

But the result of this affair that seemed at the time most fraught with evil to the stability of the government was the extraordinary and anomalous position into which Pierola was brought before the Peruvian people. Instead of being regarded as an unsuccessful revolutionist, or as a suppressed rebel, he stood forth as a hero. The government had declared the "Huascar" a pirate, and on this Rear-Admiral De Horsey acted, having been informed also that coals had been taken by her from an English coasting steamer; but Pierola was flying the Peruvian flag, and it was under this flag that he repelled the attack of the English squadron. He was, for this, regarded as the defender of the honor of the flag; and, on the return of the captured revolutionists to Callao, the government found itself unable to deal with them as offenders without running directly in the face of public opinion. This risk was not taken, and Pierola was allowed to disappear quietly from the scene.

The above presents the state of affairs in Peru up to the time of her being plunged into her present state of war with Chile. The time of the presidency of Colonel Balta has been taken as the point of departure, as that administration marks the turning-point in the affairs of the country. Up to that time the credit of the government was sound. It was then that Mr. Meiggs assumed the responsibility of railroad contracts to the amount of nearly two hundred millions soles, that foreign loans were negotiated for thirty-seven millions pounds, and that the house of Dreyfus & Co. became the fiscal agents for the government.

The causes that have led Peru to take part in the present struggle with Chile are not difficult to see; in fact, it may reasonably be supposed that the collision has been brought on by her own inspiration.

In the presentation of the financial condition of Peru in the early part of this article it is stated that the government had assumed the working and exporting of nitre as a government monopoly, from which it expected to raise a sum for its current expenses. The exportation was to be limited to this, so as not to interfere with the sale abroad of the guano hypothecated to its agents.

The exportation of nitre from Bolivia had a very palpable bearing on this matter, and it was to the benefit of Peru to stop that trade. It is known that Mr. Meiggs bought a large tract of nitrate-beds in the Bolivian province of Toco, in which the port of Tocapilla is situated,

and it was supposed, at the time, that he did this in the interest of the Peruvian government, with view to preventing it from being worked. But other large tracts of country in Bolivia, in which this nitrate was found, were being worked, under contracts from the government, by citizens of Chile, and this trade interfered with the perfect working out of the Peruvian idea. It is not difficult to suppose that the action of Bolivia in the case of these Chilean contractors was prompted by Peru; at all events, the fact stands that Bolivia, in violation of specific treaty stipulations, laid a duty on the export of nitrates sent from Antofagasta and other points in Bolivian territory. On the appeal to their government by the Chilean capitalists the government remonstrated, and the managers at Antofagasta rebelled. A collision took place at once, and Chilean ironclads were sent to Antofagasta. The action of the Chilean government having assumed this violent form, Bolivia found herself at once involved in war. Peru, thereupon, entered an ineffectual protest against the conduct of the Chilean government, which being disregarded, she was forced to assume the responsibility of the acts inspired by herself, and to range herself on the side of Bolivia in the war that is now raging. With a bankrupt treasury and a people who have to be fed by imports from abroad, this struggle must be most disastrous in its consequences, and its termination will leave her in a still more crippled condition than she is at present, for her adversary, Chile, is rich and prosperous, and there can be no doubt as to the manner in which the war will ultimately end. As to the war itself, the only features that mark it as at all interesting are the dashing acts of the "Huascar," under the command of Captain Grau, who, by his brilliant cruises along the coast, has interrupted the course of the campaign of the enemy, and has lengthened the struggle to the present time. It may be that the capture of his vessel, of which we have late information, may prove a benefit to his country by hastening to a conclusion the suicidal struggle in which Peru is now engaged.

E. Simpson,
Commodore U. S. Navy.

New London, October, 1879.

THE FIRST ARMY BILL.

As the season is at hand when the army is wont to strain eye and ear in the direction of the Capitol to catch the first—devoutly praying the while that it may also be the last—indication of the uprearing of that disturber of its peace, yclept "Army Bill," it may not be amiss to offer for its perusal the copy of the first army bill ever passed by the American Congress, which is subjoined. While this bill may have appeared in public print at the time of its passage, it is believed that it has not been published since then. It is now taken from a private copy of General Washington's orderly-book, and to a majority of the readers of THE UNITED SERVICE will have the attraction of novelty in addition to the interest with which its character naturally invests it.

The Honorable the Congress have been pleased to come to the following resolutions respecting the establishment of the Army:

IN CONGRESS, MAY 27, 1778.

The Infantry.

Resolved, That each battalion of Infantry shall consist of nine companies—one of which shall be of Light Infantry. The Light Infantry to be kept complete by drafts from the battalion, and organized during the campaign into corps of Light Infantry. That the battalion of Infantry consist of—

	Pay per Month.
1 Colonel and Captain	$75
1 Lieutenant-Colonel and Captain	60
1 Major and Captain	50
6 Captains . . . each	40
1 Captain-Lieutenant	26⅔
8 Lieutenants . . . each	26⅔
9 Ensigns . . . . each	20
1 Paymaster to be taken from the line, and to receive in addition to his pay in the line, per mo.	20
1 Adjutant, taken as above, and additional pay per month	13
1 Quartermaster, taken as above, and additional pay per mo.	$13
1 Surgeon	60
1 Surgeon's Mate	40
1 Sergeant-Major	10
1 Quartermaster-Sergeant	10
27 Sergeants . . . each	10
1 Drum-Major	9
1 Fife-Major	9
18 Drums and Fifes . . each	7⅓
27 Corporals . . . each	7⅓
477 Privates . . . each	6⅔

Each of the Field officers to command a company. The Lieutenant of the Colonel's company to have the rank of Captain-Lieutenant.

The Artillery.

That a battalion of Artillery consist of—

	Pay per Month.
1 Colonel	$100
1 Lieutenant-Colonel	75
1 Major	62½
12 Captains, each	50
12 Captain-Lieutenants, each	33⅓
12 First Lieutenants, each	33⅓
36 Second Lieutenants, each	33⅓
1 Paymaster to be taken from the line, and to receive in addition to his pay in the line, per month	25
1 Adjutant, taken as above, and additional pay per month	16
1 Quartermaster, taken as above, and add'l pay per mo.	$16
1 Surgeon	75
1 Surgeon's Mate	60
1 Sergeant-Major	11 11/30
1 Quartermaster's-Sergeant	11 11/30
1 Fife-Major	10 13/30
1 Drum-Major	10 13/30
72 Sergeants, each	10
72 Bombardiers, each	9
72 Corporals, each	9
72 Gunners, each	8⅔
24 Drums and Fifes, each	8⅔
336 Matrosses, each	8⅓

The Cavalry.

That a battalion of Cavalry consist of—

	Pay per Month.
1 Colonel	$93¾
1 Lieutenant-Colonel	75
1 Major	60
6 Captains, each	50
12 Lieutenants, each	33⅓
6 Cornets, each	26⅔
1 Riding-Master	33⅓
1 Paymaster to be taken from the line, and to receive in addition to his pay in the line, per mo.	25
1 Adjutant, taken as above, and additional pay per month	15
1 Quartermaster, taken as above, and additional pay per mo.	$15
1 Surgeon	60
1 Surgeon's Mate	40
1 Saddler	10
1 Trumpet-Major	11
6 Farriers, each	10
6 Quartermaster-Sergeants each	15
6 Trumpeters, each	10
12 Sergeants, each	15
80 Corporals, each	10
324 Dragoons, each	8⅓

Provosts.

Resolved, That a provost be established to consist of—

	Pay per Month.
1 Captain of Provosts	$50
4 Lieutenants, each	33⅓
1 Clerk	33⅓
1 Quartermaster-Sergeant	15
2 Trumpeters, each	10
2 Sergeants, each	$15
5 Corporals, each	10
43 Provosts or Privates, each	8⅓
4 Executioners, each	10

This corps to be mounted on horseback, and armed and accoutred as Light Dragoons.

Resolved, That in the Engineering Department three companies be established, each to consist of—

	Pay per Month.
1 Captain	$50
3 Lieutenants, each	33⅓
4 Sergeants, each	10
4 Corporals, each	$9
60 Privates, each	8⅓

These companies to be instructed in the fabrication of field works as far as relates to the manual and mechanical part. Their business

shall be to instruct the fatigue parties to do their duty with celerity and exactness; to repair injuries done to the works by the enemy's fire, and to prosecute works in the face of it. The commissioned officers must be skilled in the necessary branches of mathematics. The non-commissioned officers must write a good hand.

Resolved, That the Adjutant and Quartermaster of a regiment be nominated by the Field officers out of the subalterns and presented to the Commander-in-Chief, or the commander in a separate department, for approbation, and that, being approved of, they shall receive from him a warrant agreeable to such nomination. That the Paymaster of a regiment be chosen by the officers of the regiment out of the Captains or subalterns, and appointed by warrant as above. The officers are to risk their pay in his hand. The Paymaster to have charge of the clothing and to distribute the same.

Resolved, That the Brigade Majors be appointed, as heretofore, by the Commander-in-Chief, or commander in a separate department, out of the Captains of the brigade to which he shall be appointed. That the Brigade Quartermaster be appointed by the Quartermaster-General out of the Captains or subalterns in the brigade to which he shall be appointed.

Resolved, That two Aides-de-Camp be allowed to each Major-General, who shall, for the future, appoint them out of the Captains or subalterns. That in addition to their pay as officers in the line there be allowed to an Aide-de-Camp, twenty-four dollars per month; Brigade Major, twenty-four dollars per month; and Brigade Quartermaster, fifteen dollars per month.

Resolved, That when any of the Staff officers appointed from the line are promoted above the ranks in the line out of which they are respectively appointable, their Staff appointments shall be thereupon vacated. The present Aides-de-Camp and Brigade Majors to receive their present pay and rations.

Resolved, That Aides-de-Camp, Brigade Majors, and Brigade Quartermasters heretofore appointed from the line shall hold their present ranks and be admissable into the line again in the same rank they held when taken from the line; *Provided*, That no Aid, Brigade Major, or Quartermaster shall have the command of any officers who commanded him while in the line.

Resolved, That whenever the Adjutant-General shall be appointed from the line he may continue to hold his rank and commission in the line.

Resolved, That when supernumerary Lieutenants are continued under this arrangement of the battalions, who are to do the duty of Ensigns, they shall be entitled to hold their rank and receive the pay such rank entitled them to receive.

Resolved, That no more Colonels be appointed in the Infantry; but where any such commission is or shall become vacant, the battalion

shall be commanded by a Lieutenant-Colonel, who shall be allowed the same pay as is now granted to a Colonel of Infantry, and shall rise in promotion from that to the rank of Brigadier. And such battalion shall have only two Field officers, viz.: A Lieutenant-Colonel and Major, but it shall have an additional Captain.

MAY 29, 1778.

Resolved, That no persons hereafter appointed upon the civil Staff of the Army shall hold or be entitled to any rank in the Army by virtue of such Staff appointment.

JUNE 2, 1778.

Resolved, That the officers hereinafter mentioned be entitled to draw one ration a day, and no more; that where they shall not draw such ration, they shall not be allowed any compensation in lieu thereof; and to the end that they may be enabled to live in a manner becoming their stations,

Resolved, That the following sums be paid to them monthly for their subsistence, viz.: To every Colonel, fifty dollars per month; to every Lieutenant-Colonel, forty dollars; to every Major, thirty dollars; to every Chaplain, twenty dollars; to every Lieutenant and Ensign, ten dollars; to every Regimental Surgeon, thirty dollars; to every Regimental Surgeon's Mate, ten dollars; and to every Chaplain of a brigade, fifty dollars.

Resolved, That subsistence-money be allowed to officers and others on the Staff in lieu of extra rations, and that henceforward none of them be allowed to draw more than one ration a day.

Ordered, That the Committee of Arrangement be directed to report to Congress, as soon as possible, such an allowance as they shall think adequate to the station of the respective officers and persons employed on the Staff.

(Extract from the minutes.) CH. THOMSON, *Sec'y.*

All officers will be careful to make themselves well acquainted with the establishment and govern themselves accordingly. The Commissaries will be particularly observant of what relates to their department with respect to rations and subsistence-money. Till the regiments shall be arranged agreeable to this establishment, the nomination of Regimental Staff officers according to the mode here pointed out is to be suspended.

This old bill, with its colonel-captains and captain-lieutenants, its paymaster elected by the officers of the regiment, who "are to risk their pay in his hands," its bombardiers and matrosses, cornets and executioners, and other quaint features, is full of interest and suggestiveness. But time and space forbid us to yield to the temptation which it holds out to enlarge upon its contents, and we therefore lay it before the readers of THE UNITED SERVICE without comment as a curious relic of the past.

A CHAPTER OF MYTHOLOGICAL ASTRONOMY.

PART I.

In no other science have the popular and scientific ideas undergone so complete a revolution as in astronomy; though the greatest minds have essayed the solution of its problems, the field is still so vast that the advances made, even in our day of miracles, barely hint of the possibilities of its future. Questioning reverently, but fearlessly, the lessons of infinities, its footholds on the pallid mountains of truth are but coignes of vantage which reveal the grander heights towering mistily above in the ungauged realms of space. Like our race, it is the child of mystery; for, as the aspirations of its birth are lost in the dim valleys of a prehistoric past, so the triumphs of its fuller manhood are veiled, even from its most ecstatic dreamers, upon the uppermost parapets of the future.

Vague as was the earliest cosmic idea, our heritage from its youth is no ignoble one; and, even with the vast differences of past and present knowledge, in no other science have the generations which advanced it been so much indebted to their predecessors; and in none has the truth been so much the result of a gradual process of education. Nor will our legacy be less valuable: born in the purple, and the bride of a royal present of intellect, we see it descend, triple-crowned, to the inspired seekers who succeed, trustful that our discoveries and our speculations will be fitly emblazoned upon the roll of man's conquests over the limitations of his environment.

That eminent scientist, Professor Simon Newcomb, U.S.N., speaking of what we owe to the youth of the world, declares that "the great astronomers of all generations have built upon foundations laid by their predecessors; and when we attempt to search out the first founder, we find ourselves lost in the mists of antiquity. The theory of universal gravitation was founded by Newton upon the laws of Kepler, the observations and measurements of his French contemporaries, and the geometry of Apollonius. Kepler used as his materials the observations of Tycho Brahe and built upon the theory of Copernicus. When we seek the origin of the instruments used by Tycho we soon find our-

selves among the mediæval Arabs. The discovery of the true system of the world by Copernicus was only possible by a careful study of the laws of apparent motion of the planets as expressed by the epicycles of Ptolemy and Hipparchus. Indeed, the more one studies the great work of Copernicus, the more surprised he will be to find how completely Ptolemy furnished him both ideas and material. If we seek the teachers and predecessors of Hipparchus, we find only the shadowy forms of Egyptian and Babylonian priests, whose names and writings are all entirely lost. In the earliest historic ages men knew the world was round, that the sun appeared to make an annual revolution among the stars; and that eclipses were caused by the moon entering the shadow of the earth or the earth that of the moon." (*Popular Astronomy.*)

280 B.C., Aristarchus of Samos taught that the earth revolved around the sun; for which heresy he was accused of impiety and condemned to death, a sentence subsequently commuted to banishment; another philosopher, Cleanthus of Assus, conceived a moment of translation of the earth around the sun, together with one of revolution about its axis; while Pythagoreans, like Heraclides, of Pontium, believed that "the earth is not immovable in the centre of the universe, but revolves in a circle, and is far from occupying the chief place among the celestial bodies."

These guesses at the truth were, however, but the faintly-expressed faiths of the few; and to each great civilization was given a cosmic invention that was the natural outcome of its race and time. Two ideas underlie the astronomy of all these developments, and everywhere we find the primitive nations believing the earth to be a plain—the solid basis of the universe—and the sky to be a vault studded with stars. From these conceptions the scientific and religious ideas of all the races became blended; though in a less degree with the Chinese, whose astronomy was political, and among the primitive Greeks, to whom it was a speculative philosophy. The duality of Cosmos, of heaven and earth, led to a duality of spiritual faith, which, emerging from a hazy pantheism, survived as a later polytheistic theogony. The earth symbolized change,—the plastic form; the heavens, permanency,—the divine essence whence came the rain and dew, the light and warmth, all the fructifying principles which made the earth produce abundantly and eternally. With the Aryans, the race of the Vedas, the earth was P'rthovi, the wide expanse, and the heavens Varuna, the mother. In Greece, heaven was Koilos, the concave vault, the Zeus-Pater, and the earth Gé, the mother; and in the Zend-Avesta, Ormazad made Mithra the god of fructification, and Hethra, the earth, the mother of all living.

The universality of astronomical traditions proves the high antiquity of the science; and while it is impossible to define the home of the first seekers of the truth, yet we know it was assiduously and profitably

cultivated by the Aryans, the Babylonians, the Egyptians, the primitive Greeks, and, though less intelligently, by every other race that has left records of a place in history. Comparative philology would seem to indicate that the Aryan scheme first included the science; but as we know its astronomy only from poems and fables, we can predicate little of the advances made in observation by that race. From the objective Greek astronomy of an age which rejected the dreamy speculations of earlier schools come the stepping-stones upon which we have risen to higher things; and "if we confine ourselves rigorously to those whose names and labors have come down to us, we must concede to Hipparchus the honor of being the father of astronomy." The want of records alone probably prevents our tracing his beliefs to the Chaldeans, and further back still to an earlier race, the Accadians, who came from the mountains of Elam, 3000 years B.C., and gave their laws, their civilization, and their language in the arts and sciences to the Babylonians,—a tribe that followed a thousand years later and subjected the subjecting race. From a series of seventy-seven tablets, discovered at Kouyunjik by George Smith, the literature of the Chaldean civilization has been wrested; and patient study of the cuneiform characters with which they are impressed has broadened our ideas of the culture attained by that people. These tablets constituted a larger part of the literature of the Babylonians and Assyrians; and from them is derived our knowledge of their habits and beliefs, their art and science, their politics and theology. We are brought face to face with men who hitherto have been but names on the pages of Scripture,—with Sennacherib, with Tiglath-Pileser, with Nebuchadnezzar,—nay, with princes and scribes who lived and died in Ur of the Chaldees, before Abraham sought a new home in distant lands.

To these Accadians were due the civilization and the cuneiform system of writing in which its literature is enshrined; they were allied neither in blood nor in language to the Assyrians, nor indeed to the later Semitic population of Babylonia itself. In their observations of the heavens they did not confine themselves to the simplest methods, for they studied and recorded much with which modern astronomy deals; notably with dates and durations of eclipses of the sun and moon; with accurate measurements of time by water-clocks and sundials; with existences of cycles in lunar and solar phenomena, and, as a writer in the London *Times* claims, with the observation and designation of the zodiacal signs, together with the naming of the days of the week. It is possible a rude kind of telescope was known, since one of the astronomical reports states that "Venus rises and in its orbit duly grows in size;" and among the ruins of Nineveh Sir A. H. Layard found a crystal lens. Greek civilization being the outcome of the Egyptian, Herodotus claimed for Egypt a greater antiquity of cosmical investigation, and affirmed that observations had been made there

for eleven thousand three hundred and forty years; and in that period the course of the sun had been seen changed and the ecliptic observed placed perpendicularly to the equator. Absurd as these statements are, we must not condemn Herodotus as an idle romancer, for with fuller knowledge, as Buckle and Frederick Schlegel both show, we obtain a higher appreciation of the extent and minuteness of his information. We must remember the dawn of Egyptian civilization is further from Herodotus than we are from him; that even the pole star is comparatively a new-comer to the Nile, and that the Pyramids of Cheops were five hundred years old when the Southern Cross dropped below the horizon of the dwellers of the Baltic. Diodorus Siculus advances the claims of a race called the Hyperboreans, who declared their sheltered land—beyond the power of the rude north winds—to be the nearest to the moon, whereon they not only descried mountains, but, at stated periods of nineteen years, saw in majestic grandeur Apollo himself. If nothing else is gained, this fact, agreeing as it does with the Metonic circle, proves a long acquaintance with astronomy. Indeed, these Hyperboreans—Chinese as we now know them to be—did have in the earliest historic ages communication with Greece; for on the authority of a recent number of the *Norddeutsche Zeitung*, we learn that Li Fangpao, the Celestial Ambassador at Berlin, has identified as Chinese the inscription on a vase found by Dr. Schliemann in the lowest stratum of his excavations at Hissarlik. This furnishes fresh proof of the active commercial intercourse which these people maintained with Greece and Asia Minor, and confirms the identification of the inscriptions made six years ago by the eminent Orientalist, Emile Burnouf, and for which at that time he was so much criticised.

The dreadful fate of Hi and Ho affords internal evidence that the Chinese civilization knew of the science 2000 years B.C.; and at that remote period it had become so much a matter of personal government that stringent laws were enacted for its pursuit. The detailed account relates that the time of an eclipse was near, and the priests wished to learn the exact moment to prepare the libations and burnt-offerings for the offended gods. At that time, however, Hi and Ho, Astronomers Royal, neglected their duties, besotted their scientific selves with wine, forswore their offices, their books, and heaven-given instruments, and degraded themselves from their dignities and elevated ranks; they created confusion in the celestial chain and left their well-paid functions unfulfilled. Upon the first day of the third moon of autumn the Tchin (a conjunction of stars) was not in harmony with Fang (by an odd coincidence, the constellation of the Scorpion); thereupon the blind man sounded the drum and the magistrates and people became affrighted, —the chronicle affirms "like a horse let loose." Hi and Ho, being ebrious and maudlin, were as slaves at work; they heard not, neither did they see; and being unable to distinguish the celestial signs,—whose

numbers to their disguised faculties were legion,—they incurred the penalty decreed by the kings, our predecessors. The account closes with this apothegm: "the Tchingtien declares 'whoso advances the march of time shall be put to death; whoso retards it shall also be put to death!'"

In the Zend-Avesta of Zoroaster, as translated by Anquetil du Perron, the length of the summer day is stated to be twice that of the winter; as this condition is satisfied under the 49° parallel of latitude, it assigns this volume—containing some of the earliest astronomical notices—to a race living under that circle.

Josephus assures us that astronomy was cultivated by the Jews before the Mosaic deluge; detailing the public spirit and labors of the antediluvians, he writes: "Since they had learned from Adam that the world should perish by water and by fire, the fear that their science should be lost made them erect two columns, one of brick, the other of stone, on which they engraved the knowledge they had acquired; so if a deluge should wash away the column of brick, the stone one might remain to preserve for posterity the memory of what they had written. Their prescience was rewarded, and the column of stone is still to be seen in Syria." Ricard and other authorities ascribe a great part of our astronomy to the Hebrews. This is a conjecture which the stone pillar might have satisfied, but unfortunately does not. Another fragment of knowledge is left stranded on our shorelands by Josephus: "God prolonged the life of the patriarchs who preceded the deluge both on account of their virtues and to give them the opportunity of perfecting the sciences of geometry and astronomy which they had discovered, and which could not have been done if they had not lived for six hundred years, because it is only after the lapse of six hundred years that *the great year* is accomplished." Cassini pronounces this one of the most remarkable proofs of the antiquity of astronomy; for if the lunar month be taken as 29 days 12 hours 44 minutes 3 seconds, we find that 219,146½ days make 7421 lunar months, or 600 solar years of 365 days 5 hours 51 minutes and 36 seconds. But 600 is a convenient number, and the speculation may mean anything or nothing; otherwise how interpret the traditions of the Hindoos, that there are two stars diametrically opposite which pass through the zodiac in 144 years? Nothing can be made of this period, nor of another of 180 years; but if we multiply the two together we obtain 25,920, which is very nearly the length of the cycle for the precession of the equinoxes. We all know the vivid imagination of commentators,—what Shakspeare is to the German *cultus*, for instance, or even what the disciples of Wagner claim for the trilogy; and so must be on our guard against brilliant but unexact deductions.

In all these civilizations the vault was generally believed to be solid; and this doctrine received the assent of the most eminent philosophers,

and was the basis of all astronomical calculations. Simplicius, in his commentary on Aristotle, reveals the repugnance the wise men felt in admitting that a star could stand alone in space or have a proper motion of its own. They conceived the outer sky to be solid and crystalline, with the stars fixed to its surface like studs. This granted, the doctrine of concentric spheres followed, derived probably from the Persians, as this belief is found expressed in the works of Zoroaster. The early Chaldeans established three concentric spheres, the first that of the empyreal heavens, which was made of fire, but of so rare and penetrating a nature that, passing easily through the lower heavens, it was universally diffused and reached the earth; the second, the sphere of the ethereal heaven, which supported the stars; and the third, the sphere of the planets. The Persians added two more concentric spheres, one each for the moon and sun; and Aristotle gave his assent to a further increase, the less elevated heavens being necessary to explain the motions of the sun, moon, and different planets. The number of spheres gradually increased with the necessity of reconciling different celestial motions, until in the middle of the sixteenth century there were supposed to be seventy-seven concentric heavens. Tradition relates that in the thirteenth century, in the days of the king-astronomer, Alphonsus X. of Castile, there were recorded seventy-five spheres; and that on one occasion in council and before a full bench of bishops, this skeptical sovereign declared that if the Deity had done him the honor to ask his advice before creating the world, he could have shown how to have made it a little better, or at all events more simply. These spheres were actually supposed to be made of glass; a quaint error, due to the difficulty of rendering the word *crystalline* into the vernacular, and confirmed by the general assumption that as the world was created by fire, this physical condition, analogically considered, was a necessity. As late as 1815 a venerable divine is said to have told Humboldt that a large aerolite, covered with a vitrified crust, which had lately fallen, must have been a part of the crystal sky.

The system enjoying the longest and most widely spread reign is that which placed around the solid firmament a heaven of water, enclosed in a *primum mobile*, in an originator of all motions; and above and around both the undefined abode of the blessed. In the most anciently printed scientific encyclopædia, the "Margarita Philosophica," we are treated to eleven different heavens. On the exterior is the solid empyreal heavens, the immovable abode of the saints; the next sky turns the crank which revolves the aqueous heaven, the crystal firmament, and the several spheres of the sun, planets, and moon. Nor was the revolution supposed to be upon an imaginary axis; for this had a material existence, one pivot being in the northern stars, and the other in the southern, while around these there were "little naves like those of a wheel, upon which the heavens turn continually."

All these later developments centred about a primal system which was the outgrowth of the intellectual movement in Alexandria, and came to Ptolemy in an unbroken line of distinguished mathematicians and philosophers. The approval of Aristotle gave it authority and impetus, as it well might; for, as Draper says, he was the connecting link between science and philosophy in the true history of European intellectual development, "occupying the middle ground between the speculation of the old philosophy and the strict science of the Alexandrian school." Euclid, Archimedes, Eratosthenes, and Apollonius believed in and amplified its doctrines, until B.C. 160–125 we come to Hipparchus, the eminent man who established the theories of epicycles and eccentrics and discovered the precession of the equinoxes. Subsequently, A.D. 138, we find Ptolemy giving to the world his great work, "The Syntaxis," in which we see the theories invented long before his day assuming a name and a consistence. After the Mohammedan conquest of Egypt this treatise was translated by the Arabians, and under the title of the Almagest was received for centuries as the highest authority upon the mechanism and phenomena of the universe. Cicero gives an idea of the system in these words: "The universe is composed of nine circles, or rather of nine moving globes. The outermost sphere is that of the heavens, which surrounds all the others and on which are fixed the stars. Beneath this revolve seven other globes, carried around by a motion in a direction contrary to that of the heavens. On the first circle revolves the star which men call Saturn; on the second Jupiter shines, that beneficent and propitious star to human eyes; then follows Mars, ruddy and awful. Below and occupying the middle region revolves the sun, the chief prince and moderator of the other stars, the soul of the world, whose immense globe spreads its light through space. After him come, like two companions, Venus and Mercury. Lastly, the lower globe is occupied by the moon, which borrows its light from the star of day. Below this last celestial circle there is nothing but what is mortal and corruptible, except the souls given by a beneficent Divinity to the race of men. Above the moon all is eternal. The earth, situated in the centre of the world, and separated from heaven on all sides, forms the ninth sphere: it remains immovable, and all heavy bodies are drawn to it by their own weight." These doctrines taught that the heavens were spherical in form, and that all the heavenly motions were in circles; that the earth was spherical, and situated in the centre of the celestial sphere, where it remained quiescent; and that in magnitude it was only a point when compared with the stars. Above the earth and surrounding it were, in the order named, the spheres of air, of fire, of ether, and around all that of the meteors.

All the doctors of the Church acknowledged the plurality of heavens, though they differed as to the number. Neither St. Hilary

nor St. Basil would commit himself definitely, though with the courage of his opinions the Venerable Bede authoritatively announced there were six: Air, Ether, Fiery Space, Firmament, Heaven of the Angels, and Heaven of the Trinity. Different theories were promulgated to satisfy the apparent motions of the planets. The Egyptians improved upon Ptolemy by representing Mercury and Venus as revolving around the sun and not around the earth; and in the fifth century of our era Martin Capella taught a variation of the Ptolemaic system, in which he made Mercury and Venus revolve in the same orbit around the sun.

The Age of Reason in Europe was ushered in by a bitter astronomical controversy. The Geocentric doctrine—that the earth is the centre of the universe—was formulated as a belief by the Church, while a few thoughtful and religious men deprecatingly suggested the Heliocentric doctrine, that the earth was "an insignificant orb, a mere point submissively revolving among a crowd of compeers and superiors around a central sun." A century before Copernicus, Cardinal de Cusa—the fisher-boy from the Moselle—adopted partially the Heliocentric theory as taught by Philolaus, Pythagoras, and Archimedes; and ascribed to the earth a globular form, rotation on its axis, and two motions; one in space around the sun, and another with the sun around the pole of the universe. For the erudition displayed he was called before the Pontiff, Nicholas V., and was given a cardinal's hat and the bishopric of Brixen, in Tyrol,—a fair proof that the mere advocacy of the Copernican system, even in the grossly misunderstood cases of Galileo and Giordano Bruno, was not regarded as a heresy deserving of inquisitorial punishment.

The first formal assertion of the Heliocentric theory was made by Copernicus, "a Prussian, born in the Polish village of Thorn in 1473." His sketch of the planetary system—timidly and apologetically published, and then only through the influence of Nicholas Schonberg, Cardinal of Capua, and Tideman Gysius, Bishop of Culm—is given in his own words: "In the highest place is the sphere of the fixed stars, an immovable sphere which surrounds the whole of the universe. Among the movable planets the first is Saturn, which requires thirty years to make its revolution. After it, Jupiter accomplishes its journey in twelve years. Mars follows, requiring two years. In the fourth line come the earth and the moon, which in the course of one year return to their original position. The fifth place is occupied by Venus, which requires nine months for its passage. Mercury occupies the sixth place, whose orbit is accomplished in eighty days. In the midst of all is the sun." Copernicus, however, did not give up the epicycles and eccentrics of Ptolemy, and employed a third motion, which he called the declination, or a moving back along the signs of the zodiac from east to west, to explain the seasons. Galileo afterwards demonstrated

the independence of the axial and ecliptical motions, and the uselessness of this third motion. Kepler followed, and overthrew all the eccentrics and epicycles; and, after guesses and hypotheses which were submitted to calculations of infinite labor, discovered in 1609 his two great laws, and eight years subsequently his celebrated third law upon the relation of periodic times and distances. The system of Copernicus was not universally accepted, its most notable opponents being Lord Bacon and Tycho Brahe,—the latter, in 1577, describing his own system as follows: the earth was immovable in the centre of the world, and the celestial motions were arranged in such a way that the sun, moon, and the spheres of the fixed stars have it for their centre. The five planets turn about the sun (which is constantly in the centre of their orbits), and accompany it in its annual motion around the earth. Longomontanus attempted a variation on the system of Tycho by admitting a diurnal rotation, and not an annual revolution of the earth.

About 1663, Descartes, in his "Les Principes de la Philosophie," enunciated his celebrated Theory of Vortices. In this he assumed the general hypotheses of Copernicus to be correct, and then asserted that there was no vacuum in space. "The heavens are full of a universal substance . . . which has the common property of all liquids, that its minutest particles are easily moved in any direction; and when it happens they all move in one way, they necessarily carry with them all the bodies they surround and which are not prevented from moving by any external cause. The matter of the heavens in which the planets are turns round continually like a vortex, which has the sun for its centre. The parts that are near the sun move faster than those that are at a greater distance; and all the planets, including the earth, remain always suspended in the same place in the matter of the heaven. The substance that is around Saturn takes about thirty years to run its circle, and the satellites are carried around their primaries by smaller vortices. The earth is at rest, surrounded on all sides by a very liquid heaven, which carries it around, just as a vessel—which is not moved by winds or oars and is not held by anchors—remains in repose in the middle of the sea, although the flood of the great mass of waters carries it, insensibly, with it." In the eighteenth century a variation of the Descartes theory was proposed to explain the changes of magnitude in the sun's disk as seen from the earth. It assumed that the sun was not fixed in the centre of the system, but itself circulated around another centre, and carried Mercury with it.

Before the Heliocentric theory could be carried to the development which becomes axiomatic, it was necessary to amplify the laws of natural philosophy; and it was not until 1452 "that the man of capacity, Leonardo da Vinci, came at last." Great as an engineer, artist, and mathematician, Hallam declares "his knowledge was preternatural." He established natural philosophy, and through his discoveries enabled

Galileo to prove the three laws of motion, enunciated in that work upon mechanics, which alone, and without the credit due for his improvement of the telescope, would have rendered him famous. From these eminent men, in lineal descent of genius, came Newton; and in 1686 his immortal "Principia" was presented to the Royal Society. Great as were his discoveries, his method was no less great, for by the synthetical ancient geometry, and with no assistance from the analytical system, "he not only laid the foundations of physical astronomy, but carried the structure thereof very far towards completion. He unfolded the mechanical theory of universal gravitation, upon the principle that all bodies tend to approach each other with forces directly as their masses and inversely as the squares of their distances." With patience and with skill he fashioned the eager key that unlocked the mystic portals of Cosmos, and, in the flooding light of truth, revealed the perfect statue of law that so long had slept imprisoned in the marble of the universe.

Draper, in his chapter upon the Primitive Opinions of Man, traces the outgrowth of the mind from its lowest conditions of superstition. "In the intellectual infancy of a savage state," he writes, "man transfers to nature his conceptions of himself; and, considering that everything he does is determined by his own pleasures, regards all passing events as depending on the arbitrary volition of a superior but invisible power. In the distance and irresistible motion of the stars he finds arguments for the supernatural, and gives to each of those shining bodies an abiding and controlling genius. But as reason led him forth from fetichism, so, in due time, it again leads him forth from star-worship. Philosophically speaking, he is exchanging by ascending degrees his primitive doctrine of arbitrary volition for the doctrine of law."

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(To be continued.)

THE AUTOBIOGRAPHY OF AN OLD BRITISH SOLDIER.

PART I.

It is no matter of wonder that an ardent military enthusiasm seized the people of England in the earliest part of the present century. There were one hundred thousand soldiers of all arms encamped on the opposite coast of France, prepared to invade the "tight little island," under the direction of the greatest modern warrior then known to the civilized world. He did not, indeed, expect to convert England into a French province or outlying possession, but he believed (so Massena, "the spoilt child of fortune," told the Austrian Archduke Charles) that if he could land but ten thousand troops on the coast of Kent he would create a panic in England that would cost her three millions of sterling money, for he should ruin the Bank, stop the mills and the factories, and shut up thousands of stores in one day. There is little doubt that Napoleon could have wrought that much mischief, and the English knew it well enough, and even anticipated a larger amount of evil; but they were resolute to resist and avenge the attempt to the utmost of their ability. The spirit which animated the ancient Britons when they beheld Cæsar's galleys approach their shores had descended to the modern *insulaires* and took a substantial practical form, resembling, on a larger scale, the zealous preparations to confront the Spanish Armada, so vividly described in Macaulay's "Lay." We know that the destruction of the fleet on which Napoleon depended as an escort of his invading force compelled him to break up his camp at Boulogne and send his army to the Rhine; but the military spirit his menace had evoked did not evaporate with the abandonment of his great project, for the British army now became impatient to cross bayonets with the French legions on a foreign soil. The opportunity soon occurred. In the execution of his project of universal conquest, the French emperor had invaded Spain and Portugal. England, as far as loans and subsidies would go, had assisted those feeble monarchies to resist; but neither the patriotism nor the military skill of the people of the Peninsula sufficed to prevent the occupation by Napoleon's cohorts of the entire space lying between the Mediterranean, the Atlantic, and the Bay of Biscay.

Bound by the faith of treaties, strengthened by John Bull's attachment to port wine, England now deemed it necessary to go a step further. Accordingly, in 1808, after having tested the mettle and discipline of her soldiers at Maida (Calabria) in 1806, where they beat a superior French force, she dispatched some sixteen thousand troops to Portugal to commence a campaign against Napoleon's force in the Peninsula. They began by driving the enemy out of Lisbon and Oporto. These successes were followed by other achievements. Battle after battle was won by Sir Arthur Wellesley, who commanded in chief. His marvelous triumphs, with a comparatively small force and unreliable allies, filled a great space in the world's thought for the six following years. Each of the French marshals, created for their valor and skill in 1804, were baffled by Wellington's strategy and succumbed to his tactics. If he had not the genius of Napoleon, he was gifted with a large sagacity and urged to perseverance by a stern sense of duty. If he had not deeply studied the art of war as taught by Cæsar, Hannibal, and Alexander, or, later, by Turenne, Marlborough, and Frederick the Great, his natural powers indicated the road to success. He knew the value of *position* and chose his ground in the Sierras, where nature protected his flanks, or on the banks of the Douro and the Tagus, where he had no foes in his rear. His generals, some of whom had tasted war in Holland, Egypt, the West Indies, and India, were proud of their leader, and the soldiers believed in him thoroughly.[1] A strict discipline taught the men that safety and success lay in obedience and faith in one another. The Highlanders felt they were indomitable "shoulter to shoulter," and the rest of the troops knew that while the front rank could always rely on the co-operation of the rear, the rear rank believed in the valor of the front. While the French infantry advanced in dense columns, like the Greek phalanges of old, the English contented themselves with a long "thin red line," prepared, at the word of command, in a moment to wheel, close up, extend, or form squares. Thus, their line was never entirely broken, though gaps might be formed by the fire of the enemy's artillery. Wellesley's entire reliance on his army was one great secret of his victories, culminating at Waterloo, where, to the assurance that the soldiery would stand to the last, he replied, "Then I'll stand with them."

The newspapers at that time were but poor "abstracts and brief chronicles" of the events passing on the Peninsula or the Continent of Europe, for there were no special correspondents with the British forces, and the dispatches published in the official gazettes were meagre enough. But they furnished texts for eloquence in the Houses of Parliament, and excuses for bonfires and illuminations in and around the great cities of the United Kingdom. These, and the "loud twanging horns" of

[1] When he appeared among them in perilous moments in action they would call out, "Here comes hooky-nose. It's all right, boys!"

newsmen proclaiming "great victories," fired the souls of the youth of Great Britain, and the flame was fanned by reviews and sham fights on the plains and commons in the counties of Middlesex, Surrey, and Sussex, the amateur combatants being chiefly the militia and volunteer regiments, who had studied what Sir John Moore called "Sir David Dundas's d—d eighteen manœuvres."

Educated at a school conducted by French *émigré* officers,—refugees from the horrors of the Revolution,—I was not an indifferent student of *their* military system, so far, at least, as to become an adept at carte and tierce, and the broadsword cuts and guards. We had diminutive muskets with *ivory* flints and *tin* bayonets, but as the boys affected a lofty contempt for the French manual and platoon which had signally failed in the field, the *chef* of the school engaged a sergeant of the Grenadier Guards to give us lessons once a week in the science which had proved so efficacious at Busaco and Talavera, Albuera, Salamanca, and Vittoria.

Removed from school in my fifteenth year for a collegiate course at St. Omer, I found on my first retirement from scholastic exercises that the parental mind was directing itself to the choice of a profession for the favorite chick. The Law was contemplated,—for was there not the Lord Chancellor's wig in reversion? But I peremptorily vetoed the suggestion. The Church! might I not one day decorate the mitre? Faugh! The snuffling, drowsy parsons it had been my mournful lot to hear scared all interest in episcopacy. No! I would be a soldier. I had seen the Duke of Wellington and old Marshal "Vorvarts." Even the Duke of York, the commander-in-chief, had returned my salute. I had been present at reviews, and could sing martial songs with unwonted fervor. I was tall and strong, and my family could well afford to pay four hundred and fifty pounds,—the price of an infantry commission. What was there, then, to prevent my entering the army? Alas! there was one grand and insurmountable obstacle. England had secured a lasting peace with France, and had no other enemies to fear in all Europe. The king, therefore, did not need more soldiers; the country was heavily taxed to meet the half-pay and pension list and the cost of the twenty years' war with Napoleon. A small standing army sufficed for all purposes. Hundreds of officers were placed on the retired list. Many sold their commissions and went into private life. The soldier had, in fact, become a drug. The sword might at once be converted into a plowshare. Recruiting was stopped.

In this pitiable state of things I joined a troop of light-horse volunteers, whose peculiar province it was to mow down rioters,—unemployed workmen who had a singular passion for bread. It was inglorious at best to be either engaged or prepared to perform that kind of police duty, especially as the trooper got no pay and had to find his own uniform, horse, and equipment. But the "playing at soldiers" on

Hampstead Heath kept alive a noble contempt for civil pursuits, and prevented the premature extinction of the smouldering embers of my martial ambition.

One afternoon, after a glorious field-day on Wormwood Scrubbs,—a heath three or four miles from London,—as I walked my horse home through Oxford Road, my eye caught a placard headed, "*Wanted,—fine young men for the East India Horse Artillery!*"—and to render the invitation the more seductive, the placard was illustrated with a wood engraving of the kind of gallant dragoon required, tearing along at a furious pace, *ventre à terre*, delivering broadsword cut No. 1 at the neck of an imaginary Mahretta chieftain, while the heels of the charger crushed the skull of a prostrate Rajah. This was quite enough to stir the blood of any military aspirant. It seems that war was raging in India, and, as Wellesley had gained renown on the plains of Assaye, there was no reason why an humbler soldier should not seek distinction in such fields and pastures of glory. At this time (1818) as much of India as had been conquered by the English since 1757 was the property of a number of merchants and others called the East India Company (*auspicio Regis et Senatus Angliæ*), who maintained a large force of Europeans and natives,—the latter being called Sepoys, drilled and organized after the fashion of the Europeans, wearing the scarlet jacket, but, in other respects, clothed in a manner to suit the prejudices of their caste. These Sepoys, with the exception of one *emeute* in 1806, had been "faithful to their salt," and comported themselves bravely in many a hard-fought field,—but they were almost invariably associated with one or more European regiments and a company of artillery, who presented them with examples of daring and discipline, and, at the same time, acted as a check upon any mutinous manifestation. All the Sepoy as well as the European regiments were officered by Englishmen, who received their appointments from the directors of the East India Company without paying for their commissions, as was the case in the Royal Army. Our family happening to have some influence with a director, he was sounded on my behalf for a cadetship. To encourage him in the presentation he was assured by my friends that there existed an ambitious youth, born under the planet Mars, who was capable of any deed of "high emprise," and would make it well worth the while of the company to engage his services, for he had the zeal and sagacity of a Clive, and the courage of a Rollo Gillespie. But the director was either very obtuse or had promises to fulfill towards the *proprietor* of East India stock who had helped him in his election. Anyhow, he "didn't see it." His sordid ambition or alleged obligations rose above his patriotism, and he could not be induced to say more than that, if I chose to go out to Bombay as a volunteer on my own hook, he *might* hereafter have a vacancy to fill to which I *might* look forward. This melancholy indifference to a great public object damped but did

not extinguish my ardor. Since soldiers were really needed I would take my chance. I would don the blue coat of the artillery and proceed to India as a volunteer. Thus, like the troubadour of old,—

Brûlant d'amour,
Et partant pour la guerre,—

I bade farewell to all at home, and, "Heaven directed," proceeded to the recruiting depot at Chatham, in Kent, regardless alike of the tears of "sisters, cousins, and aunts," the entreaties of Julia Arlington, to whom I had plighted my troth, and the warnings of the old cook, who never "could abide them Hinges since her brother came home from *sodgering*, leaving his right leg and his liver behind him."

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Chatham, the strongest of the fortified places in England, Portsmouth perhaps excepted, is connected with Rochester,—the two cities forming one long High Street, so closely knit that only the municipalities can tell where the one begins and the other terminates. I am spared a more minute description of the locality, for it has been happily described in the Pickwick Papers. Rising above the town of Chatham proper is the Acropolis or citadel. It is fortified on Vauban's old principle, having a deep fosse, bastions, curtains, redoubts, etc., and on the eastern side a glacis sloping towards the river Medway, which it thus commands. Within the citadel are barracks for at least five thousand men and an extensive parade-ground, and connected with the ground, through a wicket, runs a short road to Brompton, a small town where the Royal Engineers are quartered. It is understood that in the event of any intestine disturbances, or the invasion of a hostile foreign force, the sovereign and royal family would find safe refuge in Chatham. Mimic siege operations on a grand scale are carried on at Chatham, and the place is likewise the arena of experiments in any new system of drill.

On my arrival at the depot at Chatham, I of course paid my respects to Colonel Hay, the commandant, who appeared delighted at so valuable an accession to the strength of the East India Company. My position was anomalous. I had not enlisted as a private, neither was I commissioned as an officer. I received no pay, but was to be rationed and take upon myself the duties of a non-commissioned officer as soon as I should be reported qualified. Luckily for me, the last batch of recruits, eight hundred in number, had just been dispatched to India by the fleet of the East India Company which annually took out the "food for powder." The staff-sergeants, who always remained at Chatham, were therefore without work to do on a large scale, and a trifling *douceur* induced one of them to take me in hand and polish me off *secundum artem*, so that when a new batch of recruits should arrive I might be in a condition to become drill-master myself. A fortnight of

incessant "right face," "left wheel," "shoulder arms," "ready, present, fire,"—as the old formula went,—made me an adept at the rudiments, and when the youths intended to "fill a pit" arrived under the escort of one of the sergeants, I was promoted to the exalted rank of lance corporal, decorated with a solitary stripe on my left arm, and nominated to the duty of indoctrinating the "young idea." Heavens! what an awful set of ragged vagabonds had been induced to take the king's shilling and exchange their liberty for a life of proper restraint! It would have been a libel on Falstaff's ragamuffins to have compared the lot who marched through Chatham with the squad he hesitated to take through Coventry. The bog-trotters of Ireland had largely contributed to the stock of embryo heroes; the ne'er-do-weel Scotch had come awa' to better their "unco condeetion"; and a herd of English youth, who would, probably, under less auspicious circumstances, have left their country for their country's good, preferred voluntary enlistment and a timely escape under feigned names to the coercion of a judge and jury who might have relegated them to a long term in Botany Bay.

It did not take many weeks to lick these fellows into shape. When they were pronounced qualified—physically by the surgeon of the depot and militarily by the sergeant-major—to take upon themselves the duties of the profession they had adopted, they were paid the bounty money, after deducting the garniture of a knapsack, called the "kit" of apparel, and necessaries in the shape of pipe-clay and blacking, and allowed a day's leave from the barracks to get drunk and sport their uniforms. At least one-half the number returned in a state of ebriety, but two or three were generally *non sunt inventi*, having mistaken the road to the barracks and proceeded *en route* to London. In anticipation of this erratic movement, the authorities had taken the precaution to place a "look-out party" at a tavern on the high-road, two or three miles away, whose especial duty it was to bring back the stragglers. A court-martial to try the wanderers was dispensed with on the humane supposition that they had involuntarily strayed, but to guard against future topographical blunders I was ordered to read the Articles of War and Mutiny Act on parade. Deeply impressed with the importance of maintaining loyalty and discipline, I took care to emphasize the penalties of military crime, declaring *à haute voix*, in the terms of the act, that for the slightest infraction of the law the offender should suffer "DEATH! or such other punishment as by a general court-martial should be awarded." And that "other" punishment generally meant "the cat,"—the cognomen applied to corporal chastisement of the most severe description. One of the infantry lads was, unfortunately, deaf to the menace, and, foolishly deserting, tore the lace off his red jacket and carelessly dropped it on the road. The scraps enabled the detectives to track the fugitive to a small ale-house off the highway and bring him back to his disconsolate friends at Chatham to receive

the penalty of his indiscretion. A court-martial was convened,—the proofs of desertion were irrefragable, and the poor wretch was sentenced to receive—I sicken while I pen the words—"five hundred lashes on the bare back in the usual manner!" The frightful cruelty of the sentence naturally shocked the sensibility of the young soldiers. The terrible amount of the award seemed out of all proportion to the offense. That a sight of the suffering culprit, as the ruthless drummers by turns laid lash upon lash on his shoulders, might act as a deterrent in the minds of all who should contemplate a breach of their engagement was hardly a sufficient justification of so awful a scourge. But, in those days, prolonged torture was, in more than one sense, *de rigueur*. It was in vain that medical officers of experience represented that, after a certain amount of infliction, the flesh ceased to quiver and the victim of the operation to suffer pain. The blood flowed from him and enfeebled him to such a degree that it was no uncommon thing for soldiers to faint under the lash and become insensible to torture. "Discipline must be upheld!" "The sentence must be carried out!" Such was the brutal reply of the martinets who commanded the "punishment parade,"—a punishment alike to the spectators and the victim at the triangle,—for who but the most hardened of heart could contemplate unmoved so frightful a scene and listen to the cries and groans of the sufferer? In some cases the severity of the flagellation had an effect the very opposite to that which was intended. Men would resort to any expedient to escape from a service where such heavy penalties attended an infraction of military law. To many of the officers, likewise, the spectacle of "a flogging" was peculiarly revolting. There was an old colonel of the artillery, who was called "Bully Belassis," because he was a blustering scold with a kind heart, who found a vent for pent-up grief and anger, when the process of corporal chastisement was performing, by violent denunciation of the offender and the men who wielded the "cat-o'-nine-tails." "Oh, you scoundrel!" he would exclaim, "you unmitigated ruffian!" (then *sotto voce* to the drummers, "Don't lay it on so hard, you d—d brute!") "you—you—I'll teach you to abscond from your colors. I'll"—"There, there, that'll do. Take the poor devil down")—and in that odd way some two or three dozen lashes were deemed equivalent to five hundred, and enough, too! Yet there were some men who preferred the lash and exposure, and a subsequent visit to the hospital, to solitary confinement in the "black hole" on bread and water; for the one involved but temporary pain, while the other was prolonged agony without the solace of beer and tobacco. Happily, "the cat" has been shorn of much of its terrors. The Duke of Wellington, listening to the appeals of the humanitarians, assented in 1847 to a reduction of the punishment to a maximum of fifty lashes, and very recently an effort has been made in the House of Commons to get rid of the form of punishment altogether. The only arguments in support

of its continuance rest on the belief that there are some soldiers so utterly deaf to moral suasion that they can only be treated as brute beasts, while on the line of march it is impossible to subject them to confinement and handcuffs without imposing on good soldiers the onerous duty of keeping them straight.

A word or two respecting the costume and equipment of the soldier of the time. Attired in a coat and pants of coarse broadcloth, with the addition of a great-coat of gray frieze; a stiff cap or chaco, the crown of which was varnished leather, reversing in form the architectural principle, and built much broader at the top than at the base, decorated with a brass plate and scales to fasten under the chin, and surmounted by a feather or a woolen tuft; with a stiff leathern stock around the throat to keep the head perpendicular, and thick solid shoes with short gaiters, the soldier was always in a fit state to receive the visitation of an apoplectic fit. His accoutrements consisted of broad leathern cross belts, to which were attached a huge brass plate in front and a heavy pouch behind for the reception of sixty-four cartridges; and his arms were a smooth-bore musket weighing eleven pounds, and a bayonet weighing four more. Altogether, when in "marching order," the weight borne by the poor fellow was at least eighty pounds. To sustain all this, his pay was one shilling per diem, out of which he paid for his rations,—a pound of fresh beef, a pound of coarse wheaten bread, and a pint of coffee with sanded sugar and well-watered milk,—leaving him barely enough for a pint of table-beer and a little tobacco.

As soon as the recruits had settled to their duty and got accustomed to their equipment, many of them deemed it advisable to write to their friends to apprise them of the change in their condition. But epistolary communication was not an accomplishment with which all were familiar; many were obliged to seek the aid of such as could write, and instead of signing their name to the letter, adopted the more simple plan of attaching a mark—generally a cross—to the foot thereof. "I can't write," would a Paddy say, "but I'll tip yez a windmill." *Patrick* $\overset{\text{His}}{\underset{\text{mark.}}{\times}}$ *O'Shaughnessy.* It was my duty to carry all these letters to the town post-office, and this operation recalled to my recollection an incident of the Peninsula war which presented an odd combination of the inhuman and the grotesque. When the news arrived of a "great victory" the soldiers' wives who had been left behind in the barracks would call to inquire if there were letters for them or any intelligence respecting their husbands. The clerk at the office, who had been furnished from the War Office with a list of the casualties, was authorized to levy a fee of a shilling from the applicant for information, and scenes of the following description were often enacted:

Enter Biddy O'Driscoll. She taps at the wicket.

The clerk appears.—"Well, what is it?"

Biddy.—"Pray, your honor, is there ever a letter for me?"
Clerk.—"What name?"
Biddy.—"Shure it would be Bridget O'Driscoll of the 44th."
Clerk (after a brief search).—"No letter."
Biddy.—"Then have you heerd any news of my man?"
Clerk (refers to record).—"Dead! A shilling,—no crying here."
Biddy.—"Boo-oo-ooh!"
Clerk.—"Be off. Crying only allowed in the yard."

And the poor creature would leave half broken-hearted to seek for solace in the society of a new husband. To assist them in the praiseworthy effort, widows were allowed to reside in the barracks for six months after the death of a husband; but if they were young and comely, they were not long in remarrying; and so often did they lose and gain a succession of husbands by the sanguinary operations of the war, that I once heard of an Irishwoman exclaiming, as a ship sailed away from Cork with a detachment of troops, "*Bad luck to you, Cove of Cork! that's the seventeenth husband you've carried away from me!*"

Parliament being dissolved, and the writs issued for the election of new members for Chatham and Rochester, it became necessary to remove the troops from the locality,—not that their presence could in any way influence the result of a contest, but because, in the tumult which generally occurred between the drunken and excited partisans of the respective candidates, there was a risk of the soldiers mingling with the mob and causing violence and disorder. Blood had frequently been shed on such occasions in earlier days. Consequent on this arrangement I was ordered to march with one hundred men and occupy Tilbury Fort, near the *embouchure* of the Thames,—a fortress rendered celebrated by Queen Elizabeth's visit to the garrison on the supposed advent of the Spanish Armada. The detachment did not return to Chatham, as the time had arrived for the embarkation of troops for India.

By this time—the winter of 1819—I had been promoted to the rank of sergeant, and was appointed to command the detachment destined for Bombay. I had never been at sea, nor, indeed, on board of any ship larger than one of the packets which crossed from Dover to Calais. The magnitude of the East Indiamen surprised me, though they would look very diminutive by the side of the stupendous steamers which cross the Atlantic. The "Lowther Castle" was of fourteen hundred and fifty tons burden, and carried six-and-twenty guns. The quarter-deck, the poop, and the main-deck, including the forecastle, occupied the surface; immediately below was the gun-deck, and between each gun a table was shipped for the sailors' messes; beneath the gun-deck was the orlop-deck, running from the main-mast to the head. The orlop was only lighted when the main hatch was open,—at other times a huge lantern, surrounded by a net-work of iron wire, cast

a dim illumination over the wretched den,—and into this obscure, unventilated cavern one hundred soldiers and six women (the maximum number allowed) were to be "cribbed, cabined, and confined" for five long months! After being detained in the Downs by foul winds for thirty days we set sail.

Gods! shall I ever forget the miseries of that voyage? More than half a century has passed away and still I can recall the dark recesses of the "Stygian cave forlorn,"—the filth, the nausea, the stifling heat, the corroding indolence, the evidences of scurvy from a continuous diet of salt beef and pork, the blasphemies of the men, the responsive screams of the poor women when squalls caused sudden lurches of the old tub,—oh! if Dante had wanted another chapter for the "Inferno," there was the material ready at hand! Before I embarked I had read of the trade-winds and the smooth seas of the Indian Ocean, and looked forward with some degree of pride and delight to the prospect of following the track of Vasco da Gama and Albuquerque to the Malabar coast; but all the poetry of the "Luciad" vanished with the aspect of the murky den into which my unfortunate *compagnons de voyage* were bundled, with the accompaniment of unsavory nautical anathemas.

The voyage was uneventful. As soon as we got into warm latitudes the soldiers were divested of their shoddy, and each man was supplied with two white duck frocks and pants and a skull-cap to match. When they mustered on deck that I might ascertain if they had made good use of soap, combs, and brushes, I could not help being reminded of the old drama of the "Miller and his Men," excepting that they failed to sing "hey, down, derry" when the wind blew. But they did good service in spite of their odd costume. There was a threatened mutiny among the seamen. A young sailor had struck a midshipman. He was tried by a court-martial and sentenced to be flogged. The sailors, influenced by a dare-devil called "Happy Jack," vowed they would cut him down if he was tied up to the hatchway grating. Forewarned, the captain desired me to parade the "Millers" on the poop, where muskets were handed up to them from the stern cabin. At six bells (3 P.M.) all hands were piped on deck. The captain, a grave, stern, religious, courageous seaman, appeared at the capstan, surrounded by his officers and half a dozen passengers—all armed. The proceedings of the court-martial were read aloud; the prisoner, who had been in irons, was tied up; the word was given to the boatswain to apply the formidable "cat": Happy Jack opened his clasp-knife and stepped forward to cut the lanyards; half a dozen men followed his example. The captain raised his pistol. "Ready!" and my trim white-coated, if not white-livered, musketeers aimed at the crew, awaiting a stern command to fire a volley. "Happy Jack" and his followers saw that the odds were terribly against them, turned tail and went to the forecastle, while the majesty of the law was vindicated and discipline upheld. It

was lucky that the volley was not needed, for, though the muskets were good of their kind, the captain had forgotten to have them loaded, or perhaps he thought that the demonstration of military force would have sufficed, and that it was better not to trust young soldiers with the means of avenging the daily insults of the sailors.

With inexpressible joy I beheld the outline of the Western Ghauts —the mountain chain on the coast of Malabar—exactly four months from the date of our leaving the Downs. Five other vessels had left at the same time, and though we saw little or nothing of the rest of the fleet during the voyage, the circumstance of their all anchoring in Bombay harbor at the same moment demonstrated the efficacy of the sailing directions of Horsburgh. All the ships were of nearly the same tonnage, the crews were alike in number, the course steered precisely the same, and as they were too near one another to suffer from separate storms, it was no marvel that they came in almost together.

Bombay, in 1819, was defended on the sea face by ramparts and other fortifications, which have since been razed. Extensive barracks occupied the centre and northern side of the city, and into these the soldiery from all the ships were duly marched after being landed in their proper regimentals, the whitey-brown frocks being returned to the purser for the use of future importations. A day or two later the artillerymen under my auspices were marched nine miles away to a place called Matoonga, where a cantonment had been established in a swamp. The barracks were of bamboo and mud thatched with dried palm-leaves; the men slept on bare boards supported by trestles; their diet consisted of curried meat and rice, with tea and brown bread. But they had plenty of gun drill, while the rain fell in torrents, for the annual *burseaut* or rainfall had commenced. It was no wonder that the hospital rapidly filled, and that the surgeon's panacea for all complaints, whether fever, liver complaint, diarrhœa, rheumatism, or cholera, was *two* calomel pills daily, until all the patients were either salivated or carried to the neighboring cemetery. The lines applied to Walcheren well fitted the *locale* of Matoonga:

"Nature sickened, and each gale was death."

Luckily the blast of war was blown in our ears before the camp was decimated entirely. The Persian Gulf swarmed with Arab pirates, who interrupted, if they did not quite destroy, the trade of Bombay with the opposite coasts. To put an end to their ravages by the destruction of their ships and strongholds was the duty of the government of Bombay, and as Mr. Elphinstone, the astute governor, had great faith in strong battalions, a powerful armament was forthwith equipped under the command of an experienced general. The force consisted of two European and four Sepoy regiments of infantry and of the company of artillery to which I was attached. The transports were con-

voyed by a British frigate and two or three armed corvettes belonging to the Bombay marine, now denominated the Indian navy.

The objective-point of the expedition was Ras-el-Khyma, near the entrance to the gulf. In two weeks we had reached the spot. Seen from the deck of a ship the place appeared to consist, as it really did, of a fortress of brick and mud, flanked and backed by a thick grove of cocoa-trees. Close by, within a cove, the Arab *dhows* (piratical vessels) were either moored or lay high and dry on the sandy shore.

Very early on the day of our casting anchor before Ras-el-Khyma the artillery and engineers were taken on shore, supported by a company of infantry, to throw up entrenchments and establish a battery of siege-guns. This engaged the entire day. In the mean while the camp equipage was landed, and the Forty-seventh and Sixty-fifth Regiments brought under canvas.

Night fell, and the artillery lay on the sand-bags under the canopy of heaven. Each man was armed with a sword and a slight fusil, but much too fatigued to care to use either. Musing on the circumstance that I was near "Omar's Sea," to which Moore, in "Lalla Rookh," had lent a poetic grace, I fell asleep. About midnight, however, the sentries on either flank of the battery gave the alarm, and the bugles and drums awakened the slumbering host. The Arabs had made a *sortie* in great force and sprung over the entrenchments into the battery, shouting, "*Allah! Bismillah! Al hummud illah!*" and brandishing their broad, double-edged scimitars. As the men hastily arose from their rude couches, they encountered the Arabs slashing about them right and left. I jumped up, drew my sword, and just managed to administer one cut in the dark, when I received a wound on my right hand which utterly disabled me, and I fell to the ground bleeding freely. At that moment Colonel Warren, of the Sixty-fifth, shouted, "Artillery, lie down!" and those who survived had scarcely obeyed the order when the infantry poured a volley into the battery, which slew or wounded many of the assailants. The rest fled, and were followed by random shots. All night thenceforth the men stood to their arms on the alert, and at daybreak, the guns being in position, fire was opened on the fortress and a breach soon established. The word was then given to advance and storm the place. There was no need for volunteering a "forlorn hope"; the two regiments and the survivors of the artillery (five young fellows had been killed) rushed forward at double-quick and entered Ras-el-Khyma, which the Arabs feebly defended and fled into the *tope* (grove). The sack yielded many rich carpets, rugs, and bags of piastres, which became the property of the captors. The fort was dismantled and the cannon removed to the transports. The *dhows* were then burnt or scuttled by the sailors of the men-of-war, and the force returned triumphant to Bombay.

J. H. Siddons.

ON THE DEAD YEAR.

Now upon the starry sea-beach of Eternity sublime
Billows up a year's completion from the turbid deeps of time.

Yes, the Old Year, like a great wave where the ocean meets the land,
Rolls and breaks, full-hearted, dying on that adamantine strand.

Rolls in might: the World of worlds impels the inevitable tide,
It whirls Saturn toward the Pleiads, on its breast the mote hath died.

Breaks,—more awful in its silence than the Atlantic surges flow,—
With triumphal crests careering, treacherous gulfs of undertow.

Oh, the rapture, fury, strength and speed, the glory of the surf!
Not the charge of war-steed, thunder-clothed, upon the trampled turf,

Nothing save our youthful ardor may compare, as, wild and strong,
Ride they on the rolling years like storms the billowy beach along.

Oh, the dancing wreaths, the foam-bells, and the rainbows of the spray!
Joys as fleeting are, and fair resolves waste airily as they.

Therefore is the wave of ocean life's true type—ah! truer still!
On the white skirts of the watery storm what sights with horror thrill!

There are ribbed wrecks—eagle-skeletons—of once far-soaring ships,
Sumptuous ventures tossed with weeds, and ghastly loves with lurid lips.

Weep salt tears for all thy dead, O Sea, though late remorse be vain!
Weep, thou briny Vast of Time, for lights that ne'er shall rise again!

Howsoe'er the year hath passed us, rolled in music, rolled with moan,
So it lies, a broken billow, a conclusion gained and gone.

We who float yet on the Present, we who watch the billows swell
By our gliding keels, unheeding silent plunge or rolling knell,

Howsoe'er our courses vary, voyaging "life's solemn main,"
Though to many goals point guiding stars, veers round the weather-vane,

Fast or slowly, surely drift we to the breakers, one by one,
And a sudden wave shall snatch us ere we dream the race is run.

Ever-starred strand of the Eternal! Ever-dark lee-shore of Death!
Ye are one, the gloom translucent to serenest eyes of Faith.

But behind the barrier and the veil what brighter waters flow,
River of Life or Sea of Jasper, we are told, but cannot know

Till to the individual Soul the world dies, with its wandering lights,
And the glory of the Godhead touches from the expressless Heights.

WILLIAM GIBSON,
Commander U. S. Navy.

SAVING OF LIFE.

THIS is a subject of vast importance, which can be but slightly touched upon in a magazine. To describe in detail all the implements in use would fill a volume. I shall therefore confine my remarks mainly to the prevention of accidents, and to the discussion of theories which it is to be hoped may lead others to investigate, and to apply remedies to existing evils.

The first and best means for saving life lies in the training of youth of both sexes to swim, and to use their limbs as well as their brains in exercises which will give them confidence in the hour of trial, whether at sea or on shore. Almost every day we read of lives lost which might have been saved if the persons had known how to use their hands and feet. Gymnastics should therefore be encouraged in our schools before the study of Greek and Latin. The public bathing-establishments should have persons constantly in attendance to teach swimming, climbing ropes, and using life-saving buoys or belts. Our steamers are generally well supplied with "life-preservers," but it is very rare to find simple directions and illustrations showing how to make them effective. Every state-room should not only have a supply of life-belts, but be provided with a life-preserver mattress in every berth, and there should be posted on the walls of every room illustrations and directions how to use them. Having had much experience on ocean steamships, I am of the opinion that too much reliance is placed on boats, and too little done in providing uncapsizable pontoons or rafts. In great emergencies by collision and stranding it is in vain to expect anything like order, unless some previous drilling or organization has been resorted to in order to prevent or mitigate panic. It is important, therefore, to have some mustering of passengers, and even on ocean steamers giving every man and woman a place, when all life-saving material should be explained. Such meetings will give confidence and tend towards order in the event of a crisis.

The Sunday church service in steamers is of great use in bringing the occupants together, and has a tendency towards life saving; but if I were called upon to say which was the most important, mustering the little world to prayer, or to exercise the life-saving apparatus, I should give preference to the latter as the more effective moral agent.

Boats, however well equipped, are often swamped in lowering or "launching," as it is commonly and wrongly termed. In great emergencies, where there has been no previous organization, every inexperienced person rushes for the boats; they are overcrowded and oftentimes swamped alongside. Hence I am a staunch advocate for rafts, or balsas; deck-seats contrived to sustain persons; all doors of deck-houses and upper cabins should be fitted with air-cases and handles, and so contrived as to be easily lifted off the hinges and made useful as life-preservers. If every seat, every door, every mattress, every hammock on board of a merchant vessel or a man-of-war were so fitted, many lives might be saved which are now lost.

My purpose, however, is not to discuss appliances to save naval men. I assume that they are or ought to be so well drilled in life saving and *killing* that anything I could say would be a work of supererogation. What would they be worth in action if not perfectly drilled? What would be the result of a disastrous collision between two men-of-war, causing the sinking of them, unless every man was drilled to take up his bed and walk overboard? And in such an event—alas! not very rare of late—the officers might suffer unless Uncle Sam provides them with life-saving mattresses. The superabundance of officers, and the slow promotion in times of peace, render this precaution of less importance. To the traveling public I would speak plainly on the necessity, in securing a passage, to consult safety—means of saving life—rather than elegance of the accommodations or the perfection of the *cuisine*. The first question asked should be, "Does your line follow some well-defined route out and home, like that taken by the Cunard ships and by one or two other lines?" next, "How many life-preserving seats, doors, belts, and hammocks have you, and are your crew and passengers made acquainted with their use?"

Next, "How many Monitor or Ryder rafts have you?" "Are your stewards and servants thoroughly drilled in having supplies ready to put into the boats or upon the rafts?" I might go on and fill a chapter in making similar inquiries. After all said and done, the ship herself should be as nearly unsinkable as possible, every compartment should be a perfect water-tight tank or reservoir, including its hatch or deck, and every compartment should have its own means for *pumping out water* and *pumping in air*. Now, if the commercial agent should pack all his valuable dry goods in water-tight packages, and if each compartment should be devoted to particular merchandise, and they be well stowed, it will readily be seen that the chances of saving life and property would be very much increased. Take, for an example, say one-half of the cargo packed in casks or water-tight bales and boxes, and supposing that three out of six of the cargo spaces are filled with goods so packed: in case of a serious break in the skin of the three spaces, very little water could enter, and every package being tight

would tend to keep the ship afloat or free enough of water to enable the motive-power to be used. A system of packing all valuable goods as suggested would not only help to save life, but would render losses much less serious to merchants and underwriters. Of course there must always be considerable dead-weight cargo, or grain, which would help in any case to sink the ship, and this fact affords a strong argument in favor of water-tight compartments and packages.

In the old times of the East India Company, all their valuable dry goods were packed in water-tight bales, which, though not very buoyant, would float and keep the contents dry for a long time. Many of the valuable dry goods sent to China and Manila were formerly packed in boxes lined with copper and soldered perfectly tight. I assume that in the long run water-tight boxes, casks, and bales would be the cheapest. Water-tight casks are always wanted for return goods, and would never be devoted to kindling-wood like the present dry-goods boxes; when those become saturated, the goods are spoiled, and the packages contribute nothing to the saving of life and property, but help to sink both. The Chinese were in the habit of building their cargo junks in water-tight compartments, and it was customary for the merchants to charter their particular hold or section. This would be a good example to follow in loading steamers.

I have alluded to pumps to draw out water or to pump in air.

It will not require the engineering knowledge of an Ericsson to show that a leak of large capacity in a well-stowed compartment full of goods in water-tight packages *would do no harm, even if let alone, beyond adding a ton or two to the weight of the ship;* now, if we apply either the air- or the water-pump, we drive out the water in the first case, or pump it out in the other. How often do we hear of ships abandoned at sea on account of sudden and alarming leaks! A ship having considerable rise of floor will at first show a rapidly-increasing leak, say twelve or fifteen inches in an hour; if the cargo be of cotton in bales, it soon swells a little; the bales become water-tight, and the ship, though abandoned with a leak of alarming capacity, *refuses to sink*, and is towed into port by some fisherman! This matter of leaking calls to my mind a question I have often asked and never heard satisfactorily answered. It is this: What is the meaning of a ship leaking so many strokes per hour? To my mind *it is without meaning*, unless as applied to some given capacity of power. In my early sea-going days, pumps consisted of wooden logs with bores varying from three to four inches, more or less, and wooden boxes with leather clappers; a stroke of the pump, as I formerly understood it, meant the completion of three movements of the brake, generally ending in a grunt of the best man at the brake, then a slight pause, and another *one, two, three, and a grunt.* It might require five hundred of such grunts or strokes in one hour to free her at first, but if let alone, three hundred might keep it from

increasing after the water got high enough to bring the cargo into exercise as floating power. Now that we have machinery and generally steam to operate pumps, a stroke in a steam-pump is understood to mean one movement of the piston, or brake, and the volume of water delivered will probably be very much larger at one stroke than at one grunt of the old log pump.

So that, on the whole, when we see daily accounts of a vessel leaking twelve or fifteen hundred strokes per hour, we know not the extent of the danger.

Our newspapers, with one or two exceptions, require marine reporters who know enough to weed out much of the trash reported by skippers and miscopied into the papers. One ship is represented as running into another, both head on, and carrying away the *stern;* another loses a topmast, and it is quaintly added that the top-gallant mast went with it! Another reports that he carried away his main *sail* from main to fore rigging; and everybody reports shipping seas sweeping everything movable overboard, and yet the men survive to tell the tale. Not only the skippers, but the printers, require much overlooking and the correcting of their marine reports.

R. B. FORBES.

CONGRESS AND THE NORTH POLE.

THE voyage of H. M. S. "Challenger," which began December 21, 1872, and ended June 12, 1876, is justly regarded by all thinking men as one of the most important expeditions of modern times. So varied and rich were the spoils of knowledge she brought back to England, —spoils that equally belonged to the scientific world,—that all question of time and treasure expended in their acquisition was dropped out of sight. No feeling but that of the highest satisfaction was expressed by any. The results repaid a thousand-fold the expenses of the outfit. And yet the "Challenger" sailed over known seas, and visited known islands and continents. Her remarkably good fortune was due to improved methods and untiring research. So true is this, that an expedition fitted out with care and forethought, and furnished with a competent and energetic corps of scientific men and modern appliances to aid their researches, could hardly sail to any sea, or touch any land on the surface of the globe, without securing a full reward for all outlay and trouble. A voyage long or short, to the east, west, north, or south, must result in new facts that will find their place in the general stock of useful knowledge; and the least of these may form the nucleus of a new branch of science, and prove of the utmost importance to mankind.

This being the case, it evidently concerns the workers in every department of science and in every land to enlarge the bounds of their field of labor and add constantly to the material which they may utilize. It concerns scientists directly and immediately. But only a little more indirectly, and a little later in time, it is of equal interest to all men. So complex a thing is civilization, and so intimate is man's relation to nature, that, aside from the satisfaction of knowing its facts and laws, his fortune and happiness are bound up with the forces about him.

We propose, on general grounds, and by a consideration of undisputed facts, to investigate the claims upon the country of any new expeditions for discovery and research at the present day; and particularly the claims of such expeditions for Arctic research and discovery. And when we speak of "the country" we recognize the truth that the general government, though the agent of the people, must act to some

extent as an independent body, according to proof presented and its own best judgment. If it is to be held responsible for its actions,—as it will and must,—it should have grounds and reasons for its actions. If it votes the people's money to aid any project, it ought, in all fairness to itself and the people, to be convinced that the outlay is demanded by public interest, and is for the public good. If this point is not clear, it has no right to recede from its position as trustee of the national funds; and, uninfluenced by fear, favor, or prejudice, it must faithfully guard the millions intrusted to its care.

It is for this reason that we wish now to examine the subject proposed in just this light. Nearly three years ago a project for discoveries in the far North was presented by the writer to Congress, and aid asked to enable it to be carried into effect. Up to the present time this aid has not been granted. The project, fully explained through memorials to Congress and through the public press, and favorably reported by committees in both Houses of the national legislature, requires no further explanation or recommendation at this time. Its principles have been carefully discussed, its merits thoroughly sifted: and the general decision of those especially fitted to judge has been that a trial should be made on the plan proposed, and that the result should determine finally its feasibility. This is the position of the question at the present moment. It is narrowed down to the simple inquiry, Can the government justly aid the scheme? Can it, in the full sense of the term, *afford* the expense necessary for the trial of the Polar Colonization Plan?

It is undeniable that hitherto Congress has been, as a rule, averse to the equipment of expeditions for exploration and strictly scientific purposes. The small number of such undertakings, and, above all, the history of their organization, are full proof of this statement. Up to 1838 no great American expedition, equipped at the public expense, had sailed the broad seas in the sole interests of science and discovery. Then Lieutenant Charles Wilkes was placed in command of the "Peacock," "Vincennes," and "Porpoise," and traversed the Pacific Ocean and neighboring waters for four years. The history of the inception of this invaluable work is not altogether creditable to us as a nation. For *twelve years* its projector had labored with untiring zeal and most convincing arguments to secure his object; and finally its usefulness was much restricted by official instructions. It seemed impossible to arouse the country to any sense of its responsibility for strictly national work. It was inclined to regard as useless the employment of any funds for the acquisition of a better knowledge of the seas constantly traversed by our ships at the risk of great peril if not of actual shipwreck. In place of national zeal there was national apathy; in place of national pride there was an easy-going inclination to let foreign countries survey, and map, and discover, and also reap the benefits. Naturally, America

could thus sail her ships by foreign charts, and at a less prime cost than that involved in making surveys for herself; but it was an unsatisfactory, second-hand arrangement that reflected no credit upon her enterprise, and eventually became a dear-bought privilege. When that thoroughly American citizen, James N. Reynolds, urged upon government the necessity of measures more energetic and consonant with its dignity and self-respect, as also with the safety and commercial interests of its mariners, he labored long in vain. And when, after himself circumnavigating the globe, he returned with redoubled zeal and intensified convictions to the task, and gained a hearing, his hopes even then were far from fulfillment. Hindrances were put in the way of the execution in their exact spirit of laws made by Congress; and what was intended to be a strictly scientific search—complete in all its parts, embracing a wide range of objects, destined to settle many disputed points, and furnish material for future work—was sadly curtailed in its proportions, facilities, and consequent richness of result.

More than ten years elapsed before another expedition sailed under the sanction of the United States government. In 1852, Commodore Perry conducted an American squadron into the China seas and brought Japan to the notice of the world. In this case he co-operated with officials of clear discernment and sound judgment, and was sustained by a liberal and far-seeing home-policy. Hence his powers were ample, and large results followed. In this case, also, the object—to open up commercial relations with an exclusive nation, and to outdo the great European powers in diplomatic manœuvring, and seize the advantages they so ardently craved—added zest to the expedition, and made it popular. The sturdy downrightness and unflinching tenacity of purpose displayed by the commodore at the gates of Japan gained the victory, to the advantage both of the United States and the sea-girt dominions of the Mikado.

These two form the prominent and most elaborate American endeavors to reap the harvest-field of the seas in the interests of general science and of commerce. They mark our highest efforts to obtain proprietorship in the oceans and their manifold products. Special ships have been detailed for special service, and they have performed their task satisfactorily; but we look in vain of late years for such an enterprise as that of sending the "Challenger" on her noble mission of peace and enlightenment.

It may be safely said that the United States have never entered heart and soul into the work of gathering knowledge from abroad,—questioning the currents of the ocean, the life from its depths, the skeletons of former life from its oozy bed; mapping its reefs and islands, and bringing back all available information as to foreign plants, animals, and peoples; interrogating the phenomena of the atmosphere, of magnetism, and every fact, above or below, that can affect our navies

and commerce. It has never risen to the importance of the subject, and been possessed with an unswerving purpose to extend the range and increase the accuracy of scientific research, and thereby enhancing the national welfare. In no other way can we fully account for the apathy with which such propositions have been treated, and the half-heartedness with which they have been carried out.

We would not do the injustice to pretend that no other reason existed for so poor a showing in the fields of exploration and discovery. Other causes have operated powerfully in times past to produce this condition of affairs. The struggles through which we passed at the period of our majority; the test of our right to the high seas; the test of our right to a fully rounded life and prosperity,—have wrought most efficiently to prevent deliberate and liberal measures for national service in the high fields of science. Private efforts, sustained by private means, have been abundant, and, considering the years of our national life, have been unsurpassed by any people. But the United States have not taken rank with the other nations in this field of labor, and to-day we suffer the consequences of the neglect.

But, notwithstanding the indifference of the general government, and the lack of funds that at times has hindered liberal action, special demands have secured special consideration. The Wilkes and Perry expeditions were both imperatively required at the time they were sent forth. The country demanded them in its own best interests. And when Lady Franklin appealed to our common humanity in behalf of her heroic husband the nation's heart was touched, and demanded that measures be taken to wrest the dread secret from the North, and save, if possible, at least some of that gallant band. With some hesitation, sufficient aid and encouragement were given to make the De Haven and Kane expeditions possible.

In less conspicuous but no less important fields, government has considered the demands of our national life. Our Coast Survey is an honor to the country, and the survey of the Territories of the West is prosecuted persistently at much cost and labor. It is seen to be a necessity to understand the physical features of our wide land, the lines of our extended coasts, the currents that wash them, and the life that fills our oceans, lakes, and rivers. Special missions have been assigned to particular vessels in the navy, and right earnestly and thoroughly have our naval officers and their subordinates done their work. We will only instance the task of the "Arctic" in making soundings across the Atlantic to find a bed for the cable; and the similar undertaking of the "Tuscarora" in the Pacific, which has been so graphically described in this journal by the talented officer in command.

In these and other instances, which we have not space to mention, the aid rendered has never been regretted. The results have repaid a thousand-fold the labor and outlay. We are greater, nobler, richer

as a nation for this work. Not a civilized nation upon earth but respects us more for both our greater and lesser expeditions in the way of discovery and research. They are each and all a glory to us. The Arctic work begun by De Haven in Smith's Sound, and prosecuted by Kane, Hayes, and Hall, shed a lustre on our country, and finally led England to make an expensive effort to outstrip us in our chosen pathway to the Pole. Our record—always excepting that of our daring whalers—would be poor indeed in Arctic history were these chapters blotted out. Not an American regrets the trifling aid given to secure these results. Not one but wishes it had been far more generous and ample.

We have spoken of the "glory" of discovery. We do not forget that we are a practical people, and seek chiefly practical ends. And if the general government sustains certain relations to this matter, we also remember that behind government stand the *people*, who create the government, and whose interests must be paramount in these things. Aside from the fluctuating state of feeling around the Capitol,—the interest or want of interest at any particular time in a given measure,—it is true that certain things are of vital moment to the country at large. And these should be provided for, not spasmodically, but permanently, making them a part of our national care.

The specially scientific interests of the country demand new explorations. The labors of our astronomers at the Naval Observatory are familiar in every land. They have raised very high the standard of excellence in their particular sphere, and with other similar institutions have made famous the accuracy of American astronomical observations. Many important new truths from the distant realms of space have been announced to the world from our observatories. Not only can our country produce the finest instruments for this work, but it is proved that we can use them to some purpose.

But the fields now occupied do not exhaust our opportunities for growth. The world is wide; and never were we so well prepared, both in instruments and training, to search the earth for its stores of facts in every branch of physics and natural history. There is a vast difference between our scientific standing now and when Wilkes sailed in 1838, or Kane in 1853. There are many more problems brought forward to be solved, and we have both the means and ability to solve them. The prime honor ever belongs to the nation that first searches out and utilizes new truths.

Within the Arctic regions, and more particularly within the Polar area, lie some of the most important secrets of nature yet undiscovered. Thither we can turn our energies with absolute certainty that our quest will be well rewarded. With new appliances for reaching a high northern field, and new problems in our note-books, as well as new ardor and intelligence for the search, we can scarcely go amiss; and

even a single wisely-directed effort may wholly surprise us with the magnitude of its consequences. No nation can now perfect itself in its scientific pursuits without some good knowledge of Polar phenomena; and knowledge acquired by its own sons and at its own expense is doubly valuable.

Further, it is almost a truism to say that our prestige among the nations requires such exertion. The persistent, enthusiastic efforts of Sir Wyville Thomson and Dr. William Carpenter for the past few years in the matter of deep-sea sounding and dredging have been attended by most wonderful successes. It has become an established part of England's concern to probe the deepest depths of the ocean and treasure specimens of its oozy floor in her cabinets. Norway regularly sends out an expedition each summer to examine the waters between her rocky shores and Iceland, Jan Mayen, and Spitzbergen, as well as those of Barentz Sea up to the very ice-belt. Hence the overflowing treasures of the "Challenger" expedition; from which we may safely predict similar stores from the present voyage of the "Alert;" and hence, also, our increasing familiarity with the European gateways to the Pole. After the successful work of English sailors around and beyond Robeson Channel in 1875–76, and especially after the glorious victory of Nordenskjold in accomplishing the Northeast Passage, what have we to show as an offset? Say what we will, England has beaten us in our best efforts to reach the northern limit of the earth; and if we would regain our prestige in Arctic discovery, even on what seems more especially our own ground, we must do it by honest work and actual superiority. Have we the means? Have we the men?

Waiving for the present the former question, we proceed to say that our army and navy both desire and need such service. Exploring expeditions are popular with both departments by sea or land. And in no direction will a gallant leader have a more eager following than when he turns the prow of his ship towards the Polar star. An enthusiasm fills the breasts of officers and men as the first ice is sighted that promises well for the severest and most prolonged struggle. The very spirit of the old vikings, who so often visited those waters, seems to return and animate them, and their song, as in days of yore, is,—

> "There's the flag on the mast, and it points to the North,
> And the North holds the land that we love!"

In a letter written by Dr. Petermann to the President of the Royal Geographical Society of London, in November, 1874, he bids God-speed to any expedition the English may send to the North, and makes some very pertinent observations upon Arctic exploration in general. He emphasizes the fact that such endeavors "*improve the spirit of the navy*," and foster a taste for science while providing for its progress. The

words of a man so fully conversant with the history of geographical discovery, and who also stood sponsor for the two German Arctic expeditions, are well entitled to a hearing. Granted that there are hardships to be undergone in Polar latitudes, there are also prizes to be won, and greater and more speedily gained than in any other field, at least during seasons of peace. For this reason English officers seek most strenuously positions in northward-bound ships; and, if faithful, promotion and many social honors are a sure reward. Thus, directly after his return, we read that "Her Majesty in recognition of his distinguished and valuable services in command of the Arctic expedition, has created Captain Nares a Knight Commander of the Order of the Bath." Commander A. H. Markham was promoted to the rank of Captain on the 3d of November, 1876. On the same day Lieutenants Aldrich, Beaumont, and Parr were promoted to the rank of Commanders, and Sub-Lieutenant Conybeare to that of Lieutenant. These were a few of the honors. The task was laborious, but the reward was swift and sure. Henceforth the men who engaged in that expedition are heroes, standing high in the list of naval worthies.

Even the very flags that accompanied the ships and sledges in their trying service, and floated in the freezing air over barren snow-fields near the Pole, catch and retain some of the honor. In many cases, even, they had an interesting history before being unfurled in the distant North. Thus the flag of Captain Nares was worked and embroidered by Lady McClintock; the sledge-flag of Commander A. H. Markham, by Mrs. Clements R. Markham. Each sledge had its name; each flag its coat of arms and motto. Every device was used to throw a halo of glory around the undertaking, and animate the men by the thought of noble deeds in the past to the performance of heroic deeds in the present.

In the equipment of the Nares expedition not an item was spared that could promote energetic and intelligent work. Aside from special fitness for their several tasks, the officers and men were not left to grope in blindness in regard to the general nature of their duties. The Royal Society took upon itself the burden of preparing a full set of instructions in every branch of science the officers would be called to investigate. The Royal Geographical Society presented a volume of "Selections of Papers on Arctic Geography and Ethnology,"—papers bearing such names as Drs. Robert Brown, Rink, and Simpson; also those of Baron von Wrangel, C. R. Markham, and Admiral Collinson. A report was added prepared by a committee of the Council of the Anthropological Institute, with a series of suggestive questions.

All this aside from the superabundant provisions for the main wants of the exploring party. Even the legendary *horseshoe* was carefully fastened to the bowsprit-head for luck! England does nothing of this kind by halves; and if we would keep pace with her in the strife of discovery we cannot afford to wholly disregard her example.

Is there nothing in all this to fire the ambition of men who have given themselves, with the best service of which they are capable, for peace or war, to their country? The "Alert" and "Discovery," with their equipments, represented the desires and hopes of the *English government*, and also of the *English people*. In this matter the two were as one. For *our* government to make a special effort in the same field will be to arouse the ambition of many brave spirits, and enable the chosen few not only to trace England's footsteps over the ice-fields of the North, but also, under the guidance of a good Providence that from the first destined man to "dominion," to stand at the Pole itself. Great Britain has always encouraged discoveries in all parts of the world, and her record in the Arctic regions is one to be proud of. She spent a large sum in equipping the last expedition, and it was not wasted. She thereby distanced every competitor; and by that very fact holds a more honorable place among the nations. And still further: by that voyage of 1875–76 she has added largely to her corps of trained Arctic seamen. She is now ready, with skilled navigators, and full experience in all the minutest details of the work, to send her ships and men almost at a moment's warning northward by the most feasible route that may open. While her seamen toiled not alone, or mainly, for rank and titles, she was wise enough to put every inducement before them, in order that in the final struggle everything might tell for their and her renown. Where she spent nearly a million of dollars Congress is asked for but a small part of that sum; but this amount wisely expended may do a great deal in the way of Arctic discovery. In this matter, as in our old Revolution, American grit, tact, and perseverance will pass current at par in every case, and help out the money-chests immensely.

The "Jeannette," whatever be her measure of success,—and it can scarcely fail of being abundant in the way of new discoveries,—did well in this at least, that she determined to seek the Pole by what may be called an American highway. She will doubtless do much towards settling the practicability of the Behring Strait route. The channels between the groups of islands lying directly north of our continent have been so thoroughly tried during the prolonged Franklin search, that access thither to a high latitude seems but little hopeful. Now, more especially, the Smith Sound route comes out prominently as *our* one remaining pathway for effort. Not every private expedition can have such a supporter as that of the "Jeannette." But the generosity of Mr. Bennett—a generosity as favorable to general science and human welfare as honorable to his own fame—has now made it possible, with but a small outlay by government, to have speedily *two* ships in the Arctic field, with a *twofold chance of success*.

Through Behring Strait and Smith Sound lie *our* pathways to the Polar regions. The former is comparatively a new way; the other

was once familiar to our keels; but nearly ten years have elapsed since the "Polaris" steamed up its channels. And still the latter is pre-eminently the American Polar route. American money, skill, courage, and endurance opened little by little the tortuous, icy way, and enabled the "Alert" finally to anchor off Floeberg Beach, in latitude 82° 27′ N. Between Greenland and Novaya Zemlya lie, perhaps, more courses than one to high northerly points. Ships from England and the Continent will doubtless reveal some facts here the coming summer. Now is certainly the time to follow England's leading, and make her discoveries fully our own. And we hope to do much more than this. By the colonization plan, already matured, and thoroughly understood in outline by the public, it is believed to be possible, starting from Discovery Harbor, to do more than simply "tramp over ground already discovered by the English expedition." The "Alert" and her consort bore hence a rich harvest. But we are confident they did not exhaust the valuable facts regarding every accessible territory around the eighty-second parallel. They traced the *coast;* of the great interior of Grant and Grinnell Lands they and we know nothing. No civilized being on earth can tell what lies to the west of the extensive coast stretching from Cape Isabella to Cape Joseph Henry. Here is room for research without going off from land directly between us and the Pole. These lands already bear American names: who shall fill them in on the charts, ourselves or foreign nations? And then the NORTH, that great trackless sea or land, reaching over the Pole to the shores of Siberia! What is there in that great Unexplored Region? We are still only on the "threshold"; but yet a little nearer than ten years ago.

The example of other nations in this matter is both stimulating and encouraging. No part of British history is more highly prized by English people than that which recalls the conquests of their Arctic heroes. This always stands side by side with the tales of great naval and land victories. In both the same decisive energy, cool bravery, and all-conquering will are requisite. It has been often noted by English writers how many of their naval officers, who afterwards won laurels on decks sprinkled with blood, were trained in early days in the rough conflicts of Polar discovery. Thus Horatio Nelson was midshipman on the "Carcass," in 1773, and "the Polar pack taught lessons which bore fruit off Cape Trafalgar." Early as little Holland gained a footing on the spicy islands where the Indian and Pacific Oceans meet, she even earlier donned her furs and boldly pushed into the northern waters. The name of the good and brave Wilhelm Barentz is treasured most lovingly by his countrymen, and by every reader of Arctic history. The story of the Dutch in the Arctic seas wakens the wildest enthusiasm to-day in the honest land of dikes and windmills; and every energy is taxed to renew the glory of that former renown. Germany, though

later, has at last met, with sturdy determination, the heavy ice off East Greenland and wintered where northern gales can make stout ships' hawsers resound like tiny harp-strings. She has passed under the enchanter's wand, and will not rest till she knows more of the haunted realm. Russia and the Scandinavian Peninsula have done splendid work in the past, and are now constantly questioning the icy waters that wash their upper shores of the secrets that lie beyond. A single Austro-Hungarian venture has brought to light a new world in the Arctic waste; and the sons of even an inland empire will not rest till Franz Josef Land is as familiar as Spitzbergen. Italian travelers plunge into Inner Africa; Italian naturalists revel in the wealth of Papuan forests; and an Italian naval officer most gladly joins fortunes with the little "Vega," in order to learn the mysteries of the frozen seas, and enable Italy in the near future to emulate the fame of the Zeno brothers. Even Spain is not without a record of this nature. And Portugal has her Arctic memories, which, if they tell of disaster, tell also of unwavering courage.

This for the past. For the present it is clear to every observer that a new and enlightened spirit in this matter is abroad. "It is satisfactory," says a recent English scientific periodical, "that the work of surveying and exploring, one of the most important public duties performed by the Royal Navy, is now receiving more attention than has been the case for some years." Leaving the "Challenger" in the Pacific, Captain George Nares took the "Alert" into the edge of Lincoln Sea; again, in August, 1878, Sir George Nares commissions the "Alert" for surveying service in Magellan's Strait and the South Pacific. Both duties were part of one wise plan: both aimed at full knowledge of all parts of the earth. And the same feeling animates all the lesser kingdoms of Europe. The effects of Professor Nordenskjold's victories, as he returns, after circumnavigating both Europe and Asia, is to awaken the maritime nations of the Old World to a new life. Denmark, having long and exhaustively carried on researches in Lower Greenland, now sees clearly the one Arctic problem that is for *her* to solve, and boldly determines to chart the missing northeastern coast of that country. And what Denmark proposes she will quietly, but effectively, perform.

If it is a possible thing, British steamers next summer will run up the west side of Franz Josef Land. And will Russia, after such glorious success in the Kara Sea and in the waters of Siberia, be content with her achievements? Will Nordenskjold, or those generous patrons of discovery, Dickson and Sibiriakof, or the *Swedish government* be content with what their wise enterprise and their funds have accomplished? It cannot be. Stanley found Livingstone; from that moment Stanley's march across Africa was assured. Since that moment discovery has gone on apace in the Dark Continent, and will continue

till it is dark and untrodden no longer. Nordenskjold now shares with Stanley the honor of being the first discoverer of the day. His success will assuredly be followed by other efforts and successes.

And let it be noted here that, though private means have done much on the other side of the water for discovery, European *governments* have not been backward in aiding and facilitating what seemed reasonable efforts towards success in such matters. Before the Geographical section of the British Association, in the summer of 1878, Sir Wyville Thomson read a paper on the progress of the Official Report of the "Challenger" expedition up to date. His statements were calculated to inspire every scientific man with gratitude to the power that had made such work possible. Years must elapse before all the material can be classified, described, and illustrated in a thorough manner. But when it is finished it will be done "not for a day, but for all time." Huge folios will contain the exact similitude of the beautiful and endlessly-varied forms of minute ocean life, filling up and rounding out our knowledge of the submarine world. When, three years previous, Dr. William B. Carpenter gave before the Royal Geographical Society a summary of observations on ocean temperature made by the "Challenger" and the "Tuscarora," the president, Sir Henry C. Rawlinson, said that "it was upon such papers as that which Dr. Carpenter had prepared that the scientific reputation of the Royal Geographical Society among Continental nations depended." And he might have added, that upon generalizations of facts thus placed in their hands depends the progress of mankind in the multifold forms of civilization.

On the supposition that these things are facts, the national legislature has an unquestioned *right* to make a reasonable appropriation in aid of a well-considered plan to push our Arctic conquests. Our few attempts have been very successful. They reflect the greatest credit upon our country; and their example and results have been stimulating and valuable to other nations as well. No one questions the right to grant the aid already given. Had it been much greater there would have been no complaint, rather, a far greater satisfaction. In a particular case the result may not seem commensurate with the expense. On the other hand, great discoveries have at times been made by very poorly-provided expeditions. But, as a rule, this is not to be expected. Said Dr. Petermann, in the letter already quoted,—and which is, indeed, a noble plea for Arctic work,—"a really effective expedition will cost more, but also accomplish more; in this respect, a writer in the *Athenæum*, in reviewing our second expedition, says that 'to start on expeditions such as these in vessels ill-adapted, ill-strengthened, ill-found, and ill-provisioned, is but to court failure,' to which I say, Amen!"

These are true words, and they reach the heart of the matter. The government *has* a right to provide for our general scientific and commer-

cial interests. The words of one of our great statesmen touching the latter subject are also timely: "A nation with fifteen thousand miles of sea-coast, fronting Europe, Asia, Africa, and South America, cannot afford to be other than a great commercial and a great naval power. If pride and prestige do not suggest it, self-interest and self-defense will demand it. It is the necessity of our situation almost as absolutely as it is the necessity of England. With equal advantages given to our people, we could in a few years outrun England in the race for commercial supremacy. But no miracle will come to our aid. If we continue to fold our arms in inaction while other nations are straining every nerve and making every outlay, we shall receive our reward in deserted ship-yards, in unemployed mechanics, in the drain of our specie resources, in the loss of our birthright, in the gradual decay of that skill in the building and sailing of ships which only abides where ships are built and sailed. We can be everything or we can be nothing. We can march in the van, or we can lie ingloriously in the rear and vanish from the race. Other nations can neither help nor hinder us. The decision is with ourselves and for ourselves."

This is exactly the fact in the case before us. We are not doing as a nation all that we ought to do in the way of Arctic research. A brave effort *just at this juncture*, when all things—peace, increasing wealth, activity in scientific thought, the example and experience of other nations, a ship already in one of our roadways to the Pole—combine to new effort, is certainly our right and duty, and we may well look for a good measure of success. The plan arranged and advocated by the writer appears to meet one of the main requisites of the day. It is an attempt on the Pole by what may be called a system of "parallels." But this is only one of its objects. The discussion of the advantages of Lady Franklin Bay for the location of a permanent station has awakened foreign interest in the subject, and it is proposed to establish other stations in high latitudes in connection with this one for scientific observation and research. The wants of mankind now demand it. A line of posts will be formed encircling the Pole, and be gradually pushed to the north till the desired ground is covered; and the proposed colony may, it is hoped, be made the first established of the stations contemplated by the recent International Geographical Congress.

The London *Times*, which cannot be considered over-sanguine in its expectations in this matter, in commenting upon the completion of the Northeast Passage, distinctly recognizes the great value of the voyage, if only to show the feasibility of stations of observation along the Siberian coast. It says, "If the professor is right in supposing that the Northeasfern passage can be safely effected in ordinary seasons by seamen who have become familiar with the nature of the regions to be traversed, then it will be easy to provide for the necessary changes of garrison all along the line of meteorological environment. The ex-

pense of such a system of observation may be considerable in itself; but any system which doubled the range of time over which our weather predictions now extend, to say nothing of an increase in the range of surface for which predictions were issued, would be of incalculable value. Apart from this, a system of meteorological supervision in Arctic regions might very readily be made the basis of commercial arrangements suitable to these frozen seas."

This extract from the leading British newspaper shows the decided drift of sentiment on this subject in Europe. The cost may be "considerable": the benefits will be "of incalculable value."

As we write news comes from Copenhagen that movements are afoot in that city for speedy action in this matter. It cannot be to the credit of the United States to have American ideas and plans utilized by other governments, when for three years a pittance has been asked in vain from Congress to enable these same ideas and plans to be carried into effect by Americans. Speedy action may avert this calamity and save the honor of the nation. A little more delay and both the opportunity and the glory will have passed to another.

Men of high position in our navy tell us of the alacrity and satisfaction with which naval officers in time of peace enter upon scientific work. They engage with hearty good will "in wide and beneficent fields of labor and researches in science by which the whole world is benefited." With this end in view they cruise in every sea, and, by correcting and enlarging charts, seek to make life and property more secure. It is a worthy end in itself. Admitting that it is neither our policy nor our desire to raise the American flag over every unappropriated island in the oceans, nor to claim every foot of accessible territory, occupied or unoccupied, that may seem a desirable base for future operations, there is a higher object for nations than mere acquisition of territory. There is a nobler destiny than to hold in fee-simple the acres of the earth. Let us imitate the higher and nobler part of the new enthusiasm and ambition displayed by our competitors.

We cannot do better in this matter than remember the closing words of Dr. Petermann's letter: "When, nearly thirty years ago, one man of science proposed that magnetical observations should be extended, it was at once answered by the government by sending out to the Antarctic regions an expedition of two vessels, the 'Erebus' and 'Terror,' under that great navigator Sir James Clarke Ross, which has never yet been eclipsed as to the importance of its results and the lustre it shed on the British navy. I do not know the views held in England now, but I know that to us outsiders the achievements and work of a man like Sir James Clarke Ross, or Livingstone, have done more for the prestige of Great Britain than a march to Coomassie that cost millions of pounds sterling."

H. W. Howgate.

WHIFFS FROM AN OLD SAILOR'S PIPE.

WHIFF THE FIRST.

THE PIRATE.

MANY years since, a vessel belonging to the United States Navy gained an unenviable notoriety from the hanging at her fore yard-arm of one officer and two petty officers belonging to the ship's company.

The crime for which these persons suffered this ignominious death was an attempt on their part to excite the crew to mutiny; the mutineers to seize the vessel, murder the officers, and then proceed on a cruise, pillaging and destroying every vessel fallen in with; their motto,—"Dead men tell no tales."

Their first intentions were, however, after gaining possession of the vessel, to sail direct for the coast of Cuba, where, at a rendezvous near the "Isle of Pines," it was reported they were to be joined by a confederate; this confederate vessel to be seized by her crew in like manner as the "S——" (the name of the United States vessel) was to have been by hers.

As about this time a Texan man-of-war, the schooner "S—— A——," had disappeared from her anchorage off a port on the coast of that republic, it gave color and strength to the story of the mutiny.

The "S——," at the time this mutiny was discovered, was on the way to New York, having made a cruise for the purpose of drilling apprentice boys, of whom the greater part of her crew was composed. Upon arriving at the navy-yard the commanding officer, who had ordered the execution of the so-called ringleaders, was detached, as were all the officers on board, in order that they might be tried by court-martial for their action in the matter. The "S——" was brig-rigged, of about two hundred and fifty tons measurement, carrying a battery of ten 32-pounder carronades, which was a heavy one for a vessel of her size. She was long in the hull, clipper-built, sat low in the water, was taut in her spars, and under sail as graceful in movement as a sea-bird on the wing.

After refitting, another set of officers was ordered to her, although nearly all of the old crew remained on board. As soon as the vessel

was reported ready for sea sealed and confidential orders were sent to the captain, which were not to be opened until arriving in latitude 33° 30′ N., longitude 73° W.

Early one morning during the latter part of June the "S——" weighed anchor from her berth off the navy-yard, getting under way under topsails and jib, with a light head wind, the tide in her favor. Short tacks were of necessity made while bearing down the East River, as the channel is very narrow. Once, when approaching too near a ferry-boat, the helm was put down and the sails thrown aback; then, as the danger of a collision was averted, the yards were braced on the opposite tack, and the vessel went around beautifully without losing headway. As she worked down the bay she looked

"A thing of beauty,"

and nautical men scanned her spars, her snow-white canvas, her clipper lines, with delight, for she was indeed beautiful to a seaman's eye.

Abreast of the Narrows, as the channel between Fort Hamilton on the one side and Staten Island on the other is called, the wind hauled to the westward; so sail was made, and we dashed through the waters with almost steamboat speed.

By noon, being well outside of the bar and near the Sandy Hook light-ship, we "hove to" and discharged the pilot, who carried our letters freighted with good-by words

"To those we left behind us."

Then, filling away and making all sail, we stood on our course towards that position in the Atlantic where the sealed orders of the Department were to be opened.

On the fourth day, having arrived in the latitude and longitude assigned for opening the instructions, the first lieutenant went into the cabin to be informed of their nature. The document read as follows:

"NAVY DEPARTMENT, WASHINGTON, D. C., June —, 18—.

"*Private. Confidential.*

"To CAPTAIN E. W., U.S.N., Commanding U. S. Brig 'S——,' Navy Yard, New York:

"SIR,—You will proceed with the vessel under your command to the south side of Cuba, and will cruise in the waters of the Caribbean Sea about the 'Isle of Pines' on the one hand, and as far as the Bay of Zagua on the other.

"You will search for a *piratical* vessel said to be lurking in that vicinity, mentioned and described to the Department as a long, low, fore-topsail schooner, carrying at times a flying main-topsail, and also an enormous square-sail.

"You will cruise in these waters until your provisions are nearly exhausted, having enough on hand to carry you into Pensacola; there other instructions will be sent you.

"During the cruise you will visit no ports, except for water or other case of necessity, and then only such a one where it will not be necessary to divulge the

character or nationality of the vessel which you command, as it is desirable that it be kept secret.

"Should you fall in with the described piratical vessel—*sink her.*

"I am, very respectfully, your obedient servant,

"G. M. B.,

"*Secretary of the Navy.*"

Such were our orders. The "S——" was to cruise in search of that vessel, the "S—— A——,"—supposed to be the confederate mentioned by the mutineers,—and falling in with her, was to mete out a swift and terrible retribution.

On the tenth day out, as we were running along merrily, with the wind on the quarter, all starboard studding-sails set, and going ten knots by the log, that cry, so sickening to all mariners, of "Man overboard!" was hailed from the fore-top.

The life-buoy was instantly let go, and the helm put up, while, during the time occupied bringing the vessel by the wind on the port tack, the studding-sails and royals were taken in, the courses hauled up, and the starboard-quarter boat cleared away for lowering.

After standing on by the wind for a few minutes we could see with our spy-glasses a swimmer striking out gallantly for the life-buoy; then, when the vessel was as near as possible to him, the main-topsail was backed, and the boat lowered, the crew of which, pulling with a will, were soon alongside the lad (for so the swimmer proved), who then, by sturdy hands, was lifted in the boat.

While in the water the lad displayed the greatest coolness, swimming for the life-buoy until he saw the boat, and when certain of safety swimming for and picking up his hat, then throwing himself on his back, floated until rescued.

This lad was about sixteen years of age; he had fallen from the fore-to'gallant-yard, where he was stationed as a "look-out," but striking the belly of the foresail in his descent, was thrown clear of the ship's side into the water, feet foremost, and escaped unhurt.

He was a bright and cheerful boy, a pet of every one on board; he it was who, on the previous cruise, had exposed the plans of the mutineers. His safety therefore, as well as freedom from injury, gave double satisfaction to us all.

After this the run out was uneventful, and we arrived safely on the ordered "cruising-ground" during "midsummer days"; then for days and weeks our only amusement was the chasing, overhauling, and boarding of all vessels fallen in with, but we could learn nothing of the described schooner, and no pirate was seen.

Time passed, and the number of empty water-casks proved to us the necessity of soon running into port for the purpose of refilling them, and after mature deliberation it was decided by the captain and first lieutenant that, to carry out the Department's instructions, *St. Nicholas*

Mole would be the most suitable place for water and recreation, as well as for secrecy.

This port is situated on the northwestern part of the island of Hayti; the entrance to the harbor is very narrow, between headlands that tower far above the spars of vessels entering, then suddenly expands into a lovely bay, of such dimensions and with such depth of water that the combined navies of every nation could therein ride in comfort and security.

The shores of this magnificent sheet of water are fringed with tropical verdure, while just back from the beach, the land gradually increasing in height is covered by grand old forests, the trees of which are luxuriant in foliage, while many are delicious in fruit. A mountain stream, gurgling through a cleft in a hill-side, finds its way along a fertile valley, murmuring over a bed of pebbles, and then loses itself in the waters at the head of the bay.

This spot was nature's own; no residents were there to question the entering stranger, and therefore it was the place for us to recruit; so thither we went, and there remained until we had refitted rigging and replenished water-casks.

The weather during our stay was delightful; the air was cooled by the sea-breeze in the daytime, while at night the land wind was deliciously cool, and freighted with the perfume of tropical flowers.

Our crew, when not employed, went rambling over the hill-sides, plucking fruits that grew on every hand, and enjoying themselves as only those who have been confined for months on shipboard well know how.

But the time came at last when all this rest, this luxury, this *dolce far niente* must cease, and one August morning the shrill pipe of the boatswain and his mates, with the call of "All hands up anchor, ahoy!" resounded through the ship, and then, with sail made to royals and flying-jib, and anchors catted and fished, the "S——," with the land breeze redolent of Cape jessamines, turned her head towards the entrance of the bay, and fanned over the waters, so clear that the bottom, thirty fathoms down, could be distinctly seen,—fanned slowly but surely, the breeze scarcely filling her royals, towards the waters of the "Windward Passage," as the channel between Hayti and Cuba is called.

At the headlands, the light wind gradually dying away, we became almost motionless, nearly becalmed, while but a short distance outside white-caps were distinctly visible to us, lashed into their foam by a stiff trade-wind blowing well from the eastward. At last a gentle puff, and our head-sails were filled, then those on the foremast; a moment later the "S——" felt the trade, and gracefully bending to the freshening force, with everything drawing, dashed onward to the northward. Scarcely were we clear of the land ere the look-out hailed "Sail ho!" and then rapid questions and responses of—

"Where away?"

"Three points off the weather bow."

"Let us know as soon as you can make her out."

"Ay, ay, sir!"

Then a hail from aloft: "A fore-topsail schooner, standing as we are." This brought all on deck, including idlers. Spy-glasses were in demand, as every one was intensely interested and desirous of making the strange vessel out.

Royals were furled, flying-jib stowed, yards braced sharp, bowlines hauled, the fore and aft main-sail set, and the vessel carefully conned, we endeavoring to get the weather gage of the stranger.

The "S——" did her work well; we were not only head-reaching, but were eating the schooner out of the wind, for in a short time she was ahead, then half a point to leeward of us, and although hull down to those on deck, she was not to those aloft.

The lee fore and main braces were now eased a little and the upper yards all braced well in; the "S——" felt the change.

"Heave the log, quartermaster."

"Eleven knots, sir."

"Go aloft, Mr. Bowline, and let me know what you think of the chase."

"Ay, ay, sir!"

But it was unnecessary for me to report. She was soon made out from deck, so rapidly did we overhaul her. Suddenly she set a *flying main-topsail*, and then,—yes,—then, in a moment, kept away and set a *large square-sail*.

This was sufficient,—the *long-looked-for, the long, low, fore-topsail schooner, with flying main-topsail and enormous square-sail*, was in sight, and would soon be under our guns.

She was found at last! "Beat to quarters!" "Clear ship for action!" "All hands work ship!" "Silence fore and aft!" "Keep away a point, quartermaster!" Such were the orders given and carried out. All eyes were now fixed on the vessel, when suddenly she "up helm" and "squared away," running for the land, which was ten or twelve miles distant.

Then the "S——" spoke from her forward gun, but the shot fell short; in a few minutes another gun, and the shot plowed the waters close to the schooner's stern. This evidently proved to those on board of her that escape was hopeless, for, lowering the "*enormous square-sail*," and taking in that "*flying main-topsail*," as well as her fore-sail, they brought the vessel by the wind; then, with "jib and main sheets to windward," she lay, like a duck on the water.

The "S——" rapidly approached, shortened sail, and rounded to on her weather quarter, with everything being in readiness to pour in a destructive fire; hailed,—

"Schooner, ahoy! What schooner is that?" "Where are you from?" "Where are you bound?" "What is your cargo?"

The answers came back clear and distinct:

"This is the schooner 'Mary Jane'!" "From Kingston, Jamaica!" "Bound to London!" "Cargo, rum and molasses!"

We lowered a boat, armed the crew, and, keeping the schooner under our guns to avoid any treachery on board of her, sent to examine her and overhaul her papers.

Everything on board was found as represented. It was true,—she was a peaceful droger, and not the pirate we had supposed.

Inquiring as to the reasons why she had made such efforts to escape, they answered,—

"*Because we took you for a pirate.*"

We were each mistaken as to the other's character. With mutual explanations and farewell words we parted company, filling away and standing on our respective courses.

The "S——" cruised for some time longer, but made no prizes, met no pirates; and, provisions getting short, put into Pensacola.

The "S——" on her next cruise was knocked down in a "norther," when off the Mexican coast, and foundered.

The "S—— A——," the Texan man-of-war schooner, was never heard of after her disappearance. She had foundered during the "norther" that had blown her from the anchorage.

Thus each one of these vessels met with the same fate. Each one was driven to destruction by winds from the same quarter. And now, over each one of their buried hulls the winds of the Gulf of Mexico sing requiem.

E. L. Bowline.

ABOUT HELIOGRAPHS.

THE word "heliograph" is a common name for several inventions, all of which aim to render communication by sun-flashes practicable under circumstances where other methods are impossible or unreliable.

To understand the significance of the various names given by inventors to their respective devices for attracting attention, conveying information from a distance, signaling, etc., we have only to consider their derivation. In Greek, "helios" is the *sun*, and "grapho" means to *write;* hence heliograph means literally to write by the sun. "Tēle," *far off*, and "skopos," to *view*, furnish us with our far-seeing instrument, the telescope, wherefrom the compound *helio-telegraph*. "Heliotrope" means the *sun* and to *turn*, and in geodesy a heliotrope is an instrument for making signals to an observer at a distance by means of the sun's rays thrown off from a mirror.

Finally, "heliostat," the *sun*, to *stand*, or to be *fixed in place*, can be watched by the "helioscope," the former appropriately meaning an instrument by which the sun's rays can be kept in a fixed position.

Heliographs are of various patterns. Differing in construction and in method, they are alike in principle. All are designed to reflect solar rays with ease and precision in any required direction; to preserve them constantly in that direction notwithstanding the (apparent) motion of the sun, and, by slightly changing and restoring the inclination of the mirror, or by the movement of a screen in front of the mirror, to make the flashes appear and disappear in rapid succession to a distant observer, and so to indicate words.

Soldiers know that the glint from a bright rifle-barrel or polished sword-blade attracts the eye of a watchful enemy at a great distance. Schoolboys love to imitate the fire-swinging signalists of Polybius's time, and the North American aborigines of the present day, by flashing sunlight from shining metallic surfaces or from bits of looking-glass.

A plane mirror, an inch in diameter, can be seen in sunny weather at a distance of eight miles, and Mr. Francis Galton's hand-heliostat consists simply of a mirror small enough to be carried in the hollow of the hand.

On a day that colors on the largest scale—such as green fields and

white houses—are barely distinguishable at seven miles' distance, a looking-glass no larger than the finger-nail transmits signals visible to the naked eye.

The result of experiments in England showed that the smallest mirror visible subtended an angle of one-tenth of an inch. A glass mirror only three inches across reflects as much of the sun as a globe of one hundred and twenty feet diameter, and looks like a dazzling star at ten miles' distance. The mirror should be of truly parallel glass, that is, a perfect plane. Alvan Clark & Sons made a heliostat for the use of the American observing parties in photographing the recent transit of Venus, so perfectly true that a straight-edge laid upon the glass showed that there was not an inequality so much as a hundred-thousandth of an inch upon any portion of its surface out of the plane. This heliostat was used in the total eclipse of April, 1875,—provided with a driving apparatus to deflect the sun's rays constantly in the same horizontal direction.[1]

Under ordinary conditions of the atmosphere, in sunny climates, a three-inch square mirror can be used up to twelve miles; a four-inch mirror can be depended upon for signaling up to twenty miles, and in very clear weather up to forty miles.

As the distance to be signaled over increases, so must the size of the mirror be enlarged, in order to carry on communication satisfactorily. The reflection of the sun's rays from a mirror is always a true image of the sun, whatever be the shape or size of the mirror; but an increased area of reflecting surface gives greater intensity, and, consequently, penetrating power, to the flash.

Heliograph mirrors are made plane, concave, corrugated, and convex, of plate-glass, polished steel, white metal nickel-plated, speculum metal, and of various shapes; but preference is given to plane plate-glass, despite objections of fracture by concussion, discharge of heavy ordnance, careless handling, etc.

To those who have not studied the phenomena attending the reflection of sun-light, experiments with any form of heliograph cannot fail to be interesting, and the judgment is apt to fall captive to the imagination in forming an estimate of the practical value of the sun-signaling instrument.

A simple method of directing a flash from a mirror, and at the same time showing the distance-range of reflected light, is as follows:

Fasten two playing-cards at opposite ends of a broom-handle, and at right angles to it. We will call the cards A and B, respectively. Pierce the centre of each card with a needle or pin. Plant a post

[1] The American expeditions sent out to observe the transit of Venus of 1874 made use of the heliostat in photographing the successive aspects of that phenomenon by means of telescopes of long focus, forty-feet instruments, which without it could not have been employed at all.

having a cleft top in the ground, and set the broom-handle horizontally into its top. Sight the distant station through the holes in A and B; when adjusted, carefully steady the broom-handle in that position. With a hand-mirror throw the shadow of A upon B. The pin-hole in centre of A will throw a white speck upon B; adjust the mirror so that the pencil of light through A strikes aperture in B, and you will have a steady flash illuminating the distant station.

This is a primitive heliostat. It is in no sense a "talking machine"; the heliograph *is* a "talking" instrument. The difference is the same in principle as if the moon, instead of giving us a uniformly reflected light, gave intermittent flashes.

In order to send a flash with accuracy, some sighting-point must be placed near to the mirror and in the path of an imaginary right line directly from its centre to the distant station. This sighting-point answers the same purpose as the front sight of a rifle. The signaler has only to direct the flash carefully at the sighting-point, and, by the pressure of a finger-key, or the movement of a screen, or the lowering of a curtain, make the flashes of long or short duration at his pleasure. Thus "dots," "dashes," etc., are shown. When the sun is behind the signaler, a second mirror is placed at such an angle that the reflections thrown on it from the first or working-mirror can be seen by the distant observer. No single mirror system will ever be successful, for the reason that the use of such is restricted to certain hours.

The sun's rays, early morning, come from a point too low down in the horizon for signals to be sent westward; and at about sunset no flashes could be sent east unless two mirrors were used.

By the duplex system no such restriction obtains. The second mirror receives the full rays of the sun and reflects them into the other, from whence they are thrown to the distant station. In sunny weather, signals can thus be sent in all positions of the sun above the horizon, and no "dead angles" exist. Using two mirrors, the boundaries of the flash are larger, yet the light itself is less intense, owing to greatly increased absorption caused by the second mirror. The range of the heliograph is limited also by the loss of light due to reflection, just as the sun's rays sustain a loss in temperature after striking the earth. Free range is obviously essential to every form of visual signaling. This mode of signaling can best be used in such climates, and during such seasons, as the sky is clear of clouds. It is also greatly affected by the condition of the atmosphere, not only as to cloud and haze, but also by strata of unequally heated air,—which are almost sure to be found at long distances,—which may make sun-signaling impossible, even when the atmosphere seems to be clear. These conditions are not always present, and the capability of being at all times available cannot be claimed for any heliograph. The immense distances to which reflected light has occasionally been known to travel is not a fair cri-

terion by which to judge of the practical value of the heliograph as a reliable talking instrument. The instrument, notwithstanding, may be regarded as an auxiliary to other military signaling apparatus requisite to maintain permanent lines of communication. These are found in the field telegraph lines, flags, torches, semaphores, the various sound signals, bombs, etc., fully described in the manual of signals by General Myer, Chief Signal Officer U.S.A. Where lines of electric telegraphy are not existent, or are temporarily deranged, and the conditions circumscribing or destroying the usefulness of the heliograph do not obtain, it is an efficient instrument for communication, because it possesses the capability of *making itself seen*, and, hereafter, it will probably be made a part of the outfitting signal equipment of every regiment or smaller independent command. There is no one perfect signaling instrument independent of other appliances. There are exigencies, seasons, and times during which no one signaling device is infallible, hence no single method comprehends an inalienable power of holding rapid communication from one end of the country to the other. Because it is a conceded fact that the sun's rays travel ninety-two million miles to reach the earth and yet preserve vital energy enough to, even after striking a mirror, travel some score of miles farther, it does not follow that, practically, the limitation of limited range does not apply to the heliograph. Converting the sun's rays into speaking messages, using the heliograph, places within the reach of every signalist a method of communication the philosophy, as well as the operation of which, he should thoroughly understand.

The mirror may be regarded as the apex of a cone, the base of which is at the receiving station, and the sides of which are rays of light. The greatest intensity of a flash lies along the axis of this cone of light. In sighting, the object to be attained is to direct this axis on the distant station. There is absolute guarantee that the most intense reflection is being projected on the point signaled to when the mirror is so adjusted that the prolongation of its centre is coincident with the axis of the cone. To effect this, the receiving station must be aimed at through a hole in the mirror at the transmitting station, and the sighting-disk brought into the exact alignment. When this is correctly done, the shadow made by the unsilvered portion of the mirror will be seen in the centre of the disk. The heliograph is then accurately adjusted, and, to be assured that the receiving station gets the full blaze, the operator has only to thereafter preserve the stability of his instrument, and to *keep* the shadow-spot on the original position on the disk. But, aside from the apparent movement of the sun,—due to the rotation of the earth,—these two conditions are hard to fulfill, for the aim is being constantly disturbed by the working of the key attached to the mirror.

Many persons of ability have devoted their attention to the simpli-

fication of signals and the devising of processes for effecting communication with, or between, points not connected by wires, and difficult, inexpedient, or impossible to attain by ordinary methods.

In all ages signaling between ships has been regarded as indispensable, and that army which is best supplied with the facilities for speedy communication has, within itself, the inherent elements of victory.

In ancient times, ships sailed so close together that orders could be orally conveyed, while the turning of a shield from right to left, or the reverse, sufficed as sailing directions to the several lines of vessels. These shields were reflecting surfaces, commonly of bronze, and served as mirrors. The solar rays, glancing from the reflecting surface, appeared as a brilliant star for many miles, rendering the exact position of the ship distinctly visible, thus serving as a heliostat.

It is said that the fleet of Alexander the Great was guided along the Persian Gulf by means of mirrors. Records of the employment of polished metal surfaces to flash the rays of the sun, and thus communicate by preconcerted methods, date back as far as the Persian invasion of Greece. Immediately after the battle of Marathon, the defeated Persians were signaled to from the mountains near Athens—by means of the reflected rays of the sun upon the polished surface of a shield—that the city would be put into their possession if they came there immediately with their fleet. "But the message signaled was also seen and interpreted by the Greeks at a distance of eighteen miles. They returned to Athens, and so that city was saved from the enemy."

About the middle of the eighteenth century, 's Gravesande invented an instrument for surveyors' use for rendering distant stations distinctly visible. This he called the "heliostat." It was improved by Molus, and consisted of a mirror whose movement was regulated by clockwork so adjusted that, when placed in the pathway of the sun, the solar rays were reflected from the mirror directly to the surveyor's station. The heliostat of the present day consists of an equatorial revolving on its polar axis, so that the sun, when once accurately in the focus of the telescope, continues *steadily fixed* there during its diurnal duration. It was first successfully used by surveying parties in Hanover about 1821. General Roy employed it in the operations he conducted to connect the meridians of Paris and Greenwich a century ago. Later, Struve's two-sighted heliostat was used in trigonometrical surveys in England.

During the reign of James II., Admiral Kempenfelt and Earl Howe systematized a *flash* method of signaling for naval use which bore a striking resemblance to those which prevailed during the naval supremacy of Greece and Carthage.

The heliotrope invented by Gauss in 1821 is described in Theodore Stein's "Das Licht," published 1877, Leipzig, Verlag von Otto Spamer.

The Gauss heliotrope—improved by Captain Drummond, H.B.M.S.

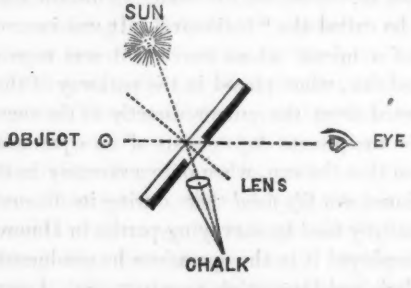
—is simply a mirror, fixed permanently at a station, so as to throw its rays to another station, or always in one direction. As the constant change, due to the sun's apparent movement, causes a corresponding change in the direction of the rays reflected by the mirror, observations require to be made the instant that the full flash of the mirror is seen by the surveyor. This heliotrope was invented for geodetic surveys. It is simpler and much less expensive than the heliostat, and for surveyors' observations answers most the purposes of the latter.

In the military dictionary of William Duane, Lieutenant-Colonel U.S.A., published in 1810, Philadelphia, a helioscope is described as "A prospect-glass to view the sun. The glass is colored to weaken the radiance of the light."

Gauss and Von Steinheil were, without doubt, the first to devise sun-flashing mirror instruments. Their inventions are fully described, with plate, in No. 116 of the *Astronomische Nachrichten*, and in Fisher's Hohere Geodesic, 1845.

Steinheil's heliotrope.—This instrument may be used to indicate the position of a distant object for the purpose of angular—horizontal or vertical—measures, or it may be employed for giving time-signals (chronometer comparisons for instance) to a distant point; observers may converse by its use by the occultation method; but it is not mechanically adapted or intended to be used as a "talking" instrument, and should be classified under the heliostats.

Its principle of construction involves the formation of an image of the sun 180° distant from the direction of the reflected rays, by means



of which the eye may perceive the distant area over which the solar light, reflected by the mirror, is diffused. This is effected as follows: the reflecting surface of the mirror is perforated in the centre, and that axis of the instrument which is directed to it carries a small lens, in the focus of which is placed a surface of white chalk or plaster of Paris. If the solar rays, admitted through the hole, are made to fall upon the lens, they are united upon the white surface, and are returned back through the lens and reflected by the lower surface of the glass (where the metallic surface had been removed), and in a direction, according to

the laws of optics, exactly opposite to that in which the *same lower* surface of the mirror reflects the sun towards the distant object. (See figure.)

To use the Steinheil heliotrope, adjust as follows:

Imagine a plane to pass through the vertical axis of the supporting screw and the optical axis of the lens, and, consequently, also through the centre of the opening in the reflecting surface of the mirror, and direct the latter to the sun.

In 1823, Sir George Everest introduced the heliotrope in India, where it was successfully used at stations one hundred miles apart. This was about contemporaneous with the surveys made in Ireland by Lieutenant T. Drummond, R.E., who attained a range of one hundred and eight miles. It was also in 1823 that Sir Goldsworthy Gurney received from the Society of Arts a gold medal for the invention of a lime-light of such brilliancy that, used in conjunction with the invention of Colonel Colby, R.E., night signaling was carried on, and, in one instance, as far as sixty-six miles. Six years later, or in 1829, Sir G. Gurney devised a plan of intermitting flash signals, which was improved upon in 1851 by Mr. C. Babbage, F.R.S.[2] The present systems of Mance, Kinney, Parrott, and Garner are allied to this latter method. Captain Begbie's method is the occultation of a permanent flash; so, too, is Lieutenant F. C. Grugan's.

The heliotrope has been in use by the United States Coast and Geodetic Survey since 1835, and has been perfectly successful on lines up to one hundred and forty-six miles in length; it has been tested this summer (1879) on a line one hundred and ninety-two miles in length. In the office of Superintendent C. Patterson, U. S. C. & G. S., Washington, is a heliotrope similar to the one used by the Parisians to communicate with their friends when that city was beleaguered by the Prussians. About 1840, General Marcy, U.S.A., suggestively referred to the use of primitive sun-signaling devices by the Indians of our Northwestern Territories. General Fremont, U.S.A., noted the same circumstance, and in 1841, Major J. D. Graham, U.S.A., made practical use of the heliostat in connection with the United States Marine boundary commission. In 1860, Mr. Francis Galton submitted to the Ordnance Select Committee, H.B.M.S., a report on the heliograph, showing the use made thereof by the Russians during the siege of Sebastopol; also on the plains of Australia and America. During eight months of 1860 the French made daily use of a line of repeating heliograph stations, the terminals being eight hundred miles apart. Prior to 1863, Lieutenant-Colonel F. J. Bolton and Captain Colomb, of the English service, submitted to the Duke of Cambridge an apparatus for communicating messages at a distance of many miles by intermittent flashes

[2] The use of an "Occulting System of Lights" was recommended to the British army by Mr. Charles Babbage, in a paper contributed in 1862 to the Transactions of the Society of Engineers.

of sunlight on a mirror, so regulated as to denote letters of the alphabet, and to spell words according to Morse's system of telegraphic correspondence. The home India Office, in June, 1863, was made acquainted with Colonel Bolton's system.

Heliostats have been used by our United States Engineer surveying parties across Lake Superior, and through its means triangles, with sides over a hundred miles in length, have been accurately laid down.

Sufficient statistics have been collated to show that the heliograph, or helio-telegraph, in its present perfected form, is the joint invention of several skilled persons; but the report of our Secretary of War for the year 1866–67 gives some information antedating the claims of later contestants, and conclusively showing that the credit for the development of this method of "talking" is justly due to Messrs. O. B. Wheeler and Robinson, Civil Engineers U.S.A. In 1865–66, Lieutenant-Colonel W. F. Raynolds, Engineer Corps, utilized the heliotrope, as a heliograph, at various distances up to ninety-two miles; and since that date it has been in general use, both for triangulation and for communication of messages on the Lake Survey.

Early in 1867, Fauth's heliotrope was used by the United States Coast Survey. It consists of a telescope body, an iron tube, having a circular mirror fitted near the eye-lens, and a sight near the object-glass, both fitting atop of the telescopic tube. It has no mechanical device for the occultation of the reflected rays. The flash is fixed, no tangent, or other, screw being provided. A wood-screw, with universal joint, is attached to the middle, so that it can be fastened to any tree or post. Weighs thirteen pounds. Is normally intended for the determination of points in geodetic surveys, and is not mechanically adapted for signaling purposes.

In 1867, Mr. George Davidson recommended to the United States Coast Survey—for the use of the Darien expedition—the adaptation of a signaling alphabet to some species of heliograph.

In August, 1866, the Horse Guards, War Office, H.B.M.S., by order of his Royal Highness the Commander-in-Chief, the Duke of Cambridge, issued a "Manual of Instruction on the use of the heliograph proposed by Captain Elphinstone Begbie, Madras Sappers and Miners, and the device invented by Mr. Henry Christopher Mance." The instructions in army signaling at Chatham, Aldershott, Portsmouth, etc., have ever since made heliograph practice an essential part of the instruction of the staff of army signalers.

The London *News* of June 20, 1878, enlarges upon the many methods of signaling taught at Chatham to representatives of every battalion of infantry and regiment of cavalry.

It includes military ballooning,—Captain J. Templer's system,—telephonic transmission, electric telegraph, heliograph, shutters, disks, semaphores, banners, torches, rockets, bombs, pyrotechnics in general.

The methods and appliances are as various as human ingenuity is prolific, and the *News* tells us how amply provided Lord Chelmsford, Commander-in-Chief in South Africa, was with these valuable auxiliaries.

In view of the foregoing facts, and the further circumstance that the heliograph was used at the Cape of Good Hope in 1823 at ranges extending to eighty miles, it is surprising to read of the many unsuccessful attempts to communicate from Ekowe to various headlands and bluffs along the Tugela River, distance thirty miles, between January 21, 1879, and April 3, 1879. The country intervening is clear of natural obstructions, free-range was practicable, yet the successful exchange of messages was the exception, not the rule; and each through message was hailed as an achievement to be reported to the press of the world!

January 21, 1879, was spent by Lieutenant-General Lord Chelmsford, with his army of four thousand men, "examining the country about Isipizi Mountain, twelve miles from Isanhlwana Mountain, and twenty-two miles from Rourke's Drift."

At the base of Isanhlwana Mountain, Lieutenant-Colonel Pulleine, with seven hundred and seventy-two European soldiers and eight hundred and fifty-one native contingents, was battling with Cetewayo's army of twelve thousand Zulus.

Lord Chelmsford "could see nothing of Lieutenant-Colonel Pulleine's command, even from the top of a high hill."[3]

Having no heliograph in use, or signal corps of observation of any practical value, Lord Chelmsford bivouacked near Isipizi Mountain until horrified by Commandant Lonsdale with the intelligence of the massacre, for the parallel of which we may look in vain through the records of warfare between civilized and savage nations.

The London *Times* says, "It is vain to cast idle regrets over the past, but there is no doubt that had visual signaling, either by the heliograph or by flags, been adopted in South Africa between Rourke's Drift, Isandula, and the advanced camp at Isipizi, the fearful disaster of the 22d January would never have occurred."

Five minutes' work by a properly-equipped signal-man, properly stationed, would have sufficed to have conveyed the intelligence brought to Lord Chelmsford's army all too late by one of the few survivors of Isandula.

The court of inquiry respecting the disaster at Isandula "forebore to express any opinion of its own as to the causes of the disaster, or the course taken by any officer." Proceedings forwarded, approved by Lord Chelmsford, January 27, from Fort Helpmakaar to English War Office, and published in the London *Gazette* without comment.

[3] See his report from Pietermaritzburg, five days later.

In the report of General U. S. Grant, commanding armies of the United States, for year 1866, p. 183, we find the following:

"It has been conclusively demonstrated that great advantage and security are afforded a military post in possessing means of communication with a friendly force over the heads of a besieging enemy. . . . I recommend, as eminently prudent and important, that charts showing signal-lines of communication radiating in all directions from the several forts be prepared, so that at any time one or the other of these lines can be occupied by signalists and communication opened. Were it necessary to bring the advantages of this more forcibly to view, I might instance Allatoona, which was *saved* by such communication, and Harper's Ferry, which was *lost* from the want of it."

The inefficiency of the English system of signaling can be appreciated by those who remember how, October 5, 1864, Major-General J. F. Corse flagged over the heads of an army this message:

"GENERAL W. T. SHERMAN,—Allatoona is closely invested, but will hold out until you can relieve it."

Had Marshal Bazaine at Metz had competent signalists, France might have been spared Sedan; but the destruction of his wires rendered electric communication impossible, his instruments inoperative, and the armies in the field, operating for his relief, were unable to communicate with him.

The same is true as regards beleaguered Paris and General Chanzy, commanding the Army of the Loire. Pigeons, balloons, etc., were sent *from* the besieged city, but not *into* it. The sieges of Metz and Paris might have been raised had an adequate system of signaling been in vogue in the French army.

So, too, during the Sepoy mutiny, Lucknow might have been cheered in advance with the intelligence that the "Campbells were coming," had the English had any such perfected system of signaling as that invented by General Myer twenty years ago, and amplified since.

It is easy to understand the usefulness of the Myer system—which includes sun-flashing instruments—in an Indian country, as by a picket, outpost, reconnoitring or flanking party, advanced or rear guards, or from a detached station, by uniting it, or them, with surrounding stations or parties.

The protection of our Northwest frontier requires constant watchfulness to give timely warning of such incursions as the Sitting Bulls are always threatening. Colonel N. A. Miles, Fifth Infantry, is said to have established a heliograph line between Fort Keogh and Fort Custer, Montana, a distance of one hundred and forty miles. If the instrument is properly supplemented with flags, etc., and there are a few intermediate stations, the line is doubtless successfully worked. A systematic telegraphic communication by the heliograph between va-

rious of the outlying West Indian islands is proposed. Permanent aerial signaling across the Straits of Gibraltar has superseded electric cables; also between Ceuta and Tangier, Morocco. The heliograph has been used by armed forces in Spain, especially from Madrid to Algeciras. Military engineers have employed it at Tarifa, and in Belgium and in France. No reason exists why it should not be adopted as a means of signaling by our shipping interests, light-houses, etc.

War brings with it the necessity for telegraphic communication. The means now used for conveying intelligence and orders in the army are,—

1. Electric telegraph.
2. Visual signaling.
3. Mounted men.

1. The electric telegraph has been regarded as affording the most rapid and accurate means of communication between fixed points. The United States expended three million two hundred and nineteen thousand four hundred dollars during the civil war in constructing and operating fifteen thousand three hundred and eighty-nine miles of electric telegraph. But much preliminary labor and a fixed apparatus is requisite to lay down and take up the wires, hence is impracticable where *time* is an element of important consideration. In a hostile country, the exposed wires would require to be guarded throughout their entire length. Its use in an enemy's country, therefore, would be restricted to that of communication within the outposts of the army.

2. Visual signaling is, in clear weather, an accurate and rapid means of communication within certain limits, requires little transport, and can be used in any region. The disadvantage of the optical method is that the signals cannot record themselves, whereas the electro-magnetic telegraph can write as well as print, and addresses the ear as well as the eye. It has the advantage, as compared with the electric telegraph, of great mobility, and of offering few points of attack to the enemy.

3. The use of mounted men in transmitting intelligence by *written* messages or oral communication is restricted by the time that is necessarily occupied and by the increase of its unit (viz., a man and a horse) for every message and for every stage in the distance.

Any method by which intelligence can be accurately, quietly, and quickly transmitted from the outposts to the headquarters of an army in the field is of incalculable advantage.

It is one of the objects of this article to show that no properly-equipped signal station is ever without some method or means of communication.

No one form of signaling is so perfect in itself as to be at all times independent of other methods or appliances.

We can never, probably, displace the well-known old reliables,—the flag and torch,—which proved their effectiveness throughout the war; and the fact that certain conditions of position and atmosphere are requisite for heliograph range, relegate that instrument to the position of a mere auxiliary to other military signaling apparatus.

The idea has long been familiar to military engineers. A great recommendation of flashing signals, addressed to the eye, over those addressed to the ear only, is seen in the comparative velocity of light over sound. The speed of light is one hundred and eighty-six thousand miles per second; that of sound is only eleven hundred and thirty feet per second. Light being the most effective agent for signaling, the technical language of the service is derived from it; thus, the long and short movements by which signal messages are conveyed are termed "flashes" when the expression refers to the obscurations by which signaling is carried on by means of the heliograph, semaphore, or puffs.

There are makeshift ways of directing the flash of a mirror, as by observing its play on an object at some yards' distance, nearly in a line with the station it is desired to communicate with. In doing this, the eye should be brought to the very edge of the mirror; there should be, as artillery-men say, as little "dispart" as possible. The aim must be a very true one, or the flash will never be seen. The efficiency of any heliograph depends solely upon the simplicity and accuracy of its mechanical construction, combined with lightness, strength, and portability. The accuracy with which messages are transmitted depends almost solely upon the care and skill with which the adjustment is made. The angle within which the reflection is visible is that subtended by the diameter of the sun, *i.e.*, 0° 32′; the illuminated circle on a sheet placed a few rods in front of the mirror being entirely independent of the size and shape of the latter, in other words, not merely the reflection of the general solar light, but being a reflection of the *image* of the *sun*, the diameter of the sun being eight hundred and fifty-two thousand six hundred miles. Further, the mean distance of the sun from the earth being ninety-one million four hundred and thirty thousand miles, we have the average diameter of the sun as 1 is to 107. Hence the distance of the observer from the mirror divided by 107 gives the lateral extension of the flash, provided the mirror be an absolute plane, which is rarely the case. At six miles' distance the flash can be seen fifty yards on each side of the true line of direction.

Signaling with the heliograph can be carried on at long ranges by moonlight, when the atmosphere is clear, which is rarely the case; also by means of any powerful artificial light, as the electric, Drummond, or magnesium.

A brilliant lime-light is obtained by passing a jet of oxygen gas

through the centre of a spirit-flame, and then causing the united oxy-hydrogen flame to impinge upon the end of a lime-cylinder, rendering it incandescent.

Portable lime-light machines are made in England for night use with heliographs.

The art of reading flash signals may be conveniently practiced in a room by the aid of a lamp or gas, and ability to read ten words a minute may be acquired in a few weeks. For professional telegraphers much less time is required.

None of the complete instruments—Begbie's, Mance's, Grugan's, Garner's, or Coast Survey—weigh over ten pounds, including case. The working parts of all are effectually protected from injury during transit, and the complete apparatus admits of being easily carried, as it is also efficiently worked by one man. One form of Captain Begbie's must be excepted from this *résumé*.

With all instruments, and before taking them into the field, it is a wise precautionary measure to test the plane of the glass by throwing its reflected light upon screens set up about twenty feet distant from the mirror. If the reflecting surface be not a perfect plane, the screen will not manifest an image conforming to the true shape of the glass or sun, but will be distorted, and will be seen to consist of a number of luminous spots,—multiple reflections caused by inequalities in the glass, —hence a loss of penetrating power or tension, owing to the diffusion of light. This loss of power is unappreciable at short distances, but is of primary importance where long ranges, solar haze, light mists, smoke, translucent clouds, etc., have to be worked over or through.

That heliograph which can be worked longest without adjustment; needs but little skill to operate, and that quickly acquired; which cannot be easily thrown out of adjustment; which can be easily transported by one man; and which flashes to the greatest distance with brilliancy enough to be seen, will be a source of profit to its inventor; for it will be strange if it is not made use of for commercial as well as military purposes, and none of the instruments yet devised are free from faults. Only three patents have been issued in the United States for apparatus for signaling by means of reflected light. This fact should prove an incentive to mechanics. No single-mirror system will ever be successful.

A heliostat regulated by clock-work to move with the sun costs four hundred dollars. The price of the Mance heliograph in this country is sixty dollars. The Steinheil heliotrope, about six inches high, is thirty dollars. The Garner helio-telegraph costs forty dollars. The sematrope, convex glass, invented by Lieutenant Parrott, Volunteer Engineers, Sydney, New South Wales, is not in the market. The Kenney signaling-mirror is obsolete. The Fauth Coast Survey telescope, with mirror attachment, sells for thirty dollars. The price of

Captain Begbie's duplex heliostat is unknown to the writer. It is a very fine instrument.

Captain Begbie's method is to signal by the occultation of a fixed light, using a screen, mounted on a special tripod, or attached arm, worked by a key-handle, and reading by intervals instead of by flashes. It is essential that the interval should be perfectly defined,—as in fog-signals,—and his chronosemic method has enthusiastic advocates; the principal objections appearing to be the necessity for an extra tripod, and the number of parts employed. Again, two men are required to work this cumbersome instrument. In "talking" with it, probably less adjustment is required than with any other pattern, excepting Lieutenant Grugan's, and herein is a great gain: for an adjustment which can be preserved at all times insures, with absolute certainty, that the flash goes to the opposite station.

Captain Begbie's ingenuity has lately been exercised in the construction of a box—called the "Pattern C Heliostat"—ten by eight by five inches, within which he carries one signaling mirror, four and a half inch diameter, one sun, five and a half inch diameter, two cones, two guiding plugs, two screw-drivers, and one metallic shutter. Carried on the outside of the box are three quoins, one tripod-stand for shutter, one sighting-bar, and one shutter-lever. These last three are jointed, can be compactly folded, and the complete apparatus weighs about ten pounds.

This heliostat has no tripod, but stands close to the ground, and is worked by one man, who sits or lies behind it in operating.

The shutter serves as a screen to totally eclipse the reflected light from the distant station. It is made on the Venetian-blind principle, works in a square frame, and has three metallic leaves or slats,—horizontally placed,—connected by a bar. Attached to the centre leaf is a crank and lever. The depression of the latter turns the leaves of the shutter "edgewise," and thus exposes to the receiving station nearly the full blaze of the reflection from the mirror. A spring, attached to the lever, shuts the leaves, so occulting the flash.

The shutter is separate from the mirror and aligning arrangements. Owing to this disconnection there is no variation in the intensity of light to a reader, since possible derangements in the position of the screen—as by jarring in signaling—cannot disturb the alignment of the heliostat or brilliancy of the flash.

A modification of the Begbie heliostat has been devised by Lieutenant F. C. Grugan, U.S.A. His instrument is worked without altering the angle of the mirror in transmitting, and the flash-mirror is unmasked by wholly removing a screen, instead of changing the position of a shutter. Lieutenant Grugan's heliostat consists of fewer pieces than any of the other sun-signaling instruments referred to, but has not yet been practically tested by usage at extended ranges. So

soon as the relative merits of the respective heliographs presented for adoption in our service have been determined, the instrument is to be extensively introduced in the Department of the Missouri, commanded by Major-General John Pope, U.S.A.

One form of heliotrope used by our coast surveying parties consists of a corrugated, nickel-plated, metallic mirror, mounted on a universal joint, and attached to the rear end of a telescope. Two globe sights, securely fastened in the line of view of the telescope, and which are about twenty-four inches apart, afford a tolerably certain and easy method of securing accurate direction. It is not adapted for a "talking" instrument.

The helio-telegraph, patented by Mr. J. W. Garner, is easy of transportation, both mounted and on foot. Weighs ten pounds, including detachable standard, pouch, and working apparatus. An extra sun-mirror accompanies the instrument, which is worked by the movable flash system. It can be placed in a box thirty-eight by nine by four inches, and can be safely carried by the exercise of the most ordinary care. The method of sighting, it is claimed, insures quick and accurate adjustment. The substitution of the conventional telegrapher's key is one of its merits. No tripod is necessary, the standard-post having braces which, it is claimed, will maintain the instrument, even on sloping ground, as steadily as would the most stable surveyor's tripod. The entire working top screws off. It can be worked independently of the standard-post, and fastened to a tree-top, stump, or window-ledge.

During the summer of 1877 the Chief Signal Officer of the army began, at Fort Whipple, Virginia, a series of experiments with every known variety of heliograph. Since that season, heliograph-practice has formed a part of the regular course of instruction of the officers detached for service as acting signal officers, United States army.

In April, 1873, a Texan named M. M. Kenney patented an adjusting signaling mirror capable of giving a double reflection, and susceptible of a vertical and horizontal adjustment and inclination at any plane. It consists of a stud or table, to which is swiveled a frame supporting a square mirror journaled into two uprights, to the larger of which is pivoted an arm, at right angles to which is hinged a second mirror. To one end of the frame is attached a folding arm, upholding a shadowing post or sighter.

When the working mirror is properly set and adjusted, facing the object upon which the flashes are to be thrown, the folding arm is moved until the post comes between the eye and the object.

An eye opening is left in the centre of the mirror by removing amalgam. The small shadow-spot, corresponding to the unsilvered part of the mirror, is brought to the edge of the post, and a lateral change of position of the mirror, given by the finger, projects flashes upon the desired point.

In the *Engineer*, December 29, 1871, M. V. Serrin suggests much valuable information upon this subject.

As an increase in the size of a mirror only increases the brightness of a flash, not its diameter, heliographs are now of two patterns,—one with large mirrors for permanent stations, or for ranges exceeding twenty-five miles; the other for field use.

Our purpose will be sufficiently served by the description of Mr. H. C. Mance's model.

There are two sizes of Mance heliograph.

One has duplex circular mirrors, each eight-inch diameter; the small field instrument has a four and five-eighths inch mirror. A complete apparatus consists of two tripod-stands, two mirrors, a haversack, and a lining or sighting rod, having on it a sliding metallic stud and cross-bar. In the instruments of latest manufacture, a compass-jointed sight supplants the foregoing, which is, for many reasons, imperfect, and has been improved upon by the substitution of a circular rim of metal having cross-hairs, with a small sighting-disk at their intersection.

Major-General Voyle, H.B.M.S., thus describes it: "An apparatus for telegraphing by means of the sun's rays. It is composed of a circular mirror, varying in diameter according to whether it be for field use or for fixed observations. This mirror revolves on a horizontal axis, and is adjusted to the required angle of incidence with the sun in connection with a telescopic rod or lever. By means of adjusting-screws, the rays of the sun can be made to fall upon any given point with the utmost precision. The mirror can be raised and depressed by a vertical rod, provided with a movable button placed at its back; and thus the flash occasioned by the sun's rays falling upon it can be made, according to the wish of the operator, of any length, varied or grouped, representing letters or words composing the message. In this system the flash is thrown upon the receiving station only when required, by depressing the key or button-rod at its back. The range is very great, and intelligibility absolute at fifty miles without a glass, and in clear weather, at one hundred miles with a telescope!"

The apparatus of Mr. Mance, in 1869, was put upon trial in India. After exhaustive tests for four years, the quartermaster-general to the commander-in-chief in India bore testimony to its great utility, stating that the signals conveyed by such means were found perfectly clear, and could easily be read in ordinary weather at a distance of fifty miles without a telescope.

It was used by the British government in India in the Jowaki campaign of 1877, and with such effect that it has since formed a part of the equipment of every division of troops in India. It was also used by the English for military purposes in the Afghan campaign and

Zulu war. The three divisions which marched last winter towards Cabul all kept up their communication by means of the flashing mirrors of this system. Sir Samuel Brown, who advanced by the Khyber Pass, established heliograph stations all the way to Jellalabad, and maintained a correspondence, with his base at Peshawur, without difficulty; his victory at Ali Musjid was communicated from the fortress itself by signals flashed to Peshawur, and many of the special correspondents employed the same means for flashing news to the nearest telegraph station. General Roberts, who commanded the Kuram column,—and now commands it once more, and is making a bold dash over the Shutargardan Pass to Cabul,—established a heliograph station at Khost, and thence flashed signals back to the fort at Bannu, a distance of sixty miles; while General Stewart, in command of the Candahar force, maintained communication by heliograph from Grishk to the Khojak Pass. And there is little doubt that if General Roberts can find a suitable spot on the summit of the Shutargardan, he will be able to telegraph thereto from Cabul when he arrives in that city. To General Roberts, indeed, we must give the credit of having introduced the heliograph into the British army.

In India, where English soldiers are mostly trained, the heads of the army departments enjoy a certain amount of independence, and thus it came about that, while the heliograph was condemned at home, the quartermaster-general in India, then Colonel Roberts, reported distinctly in its favor. General Roberts little imagined, when he put in a good word for the heliograph, that he would be one of the first to make practical use of the instrument. His recommendation that "six or eight instruments be made and stored up with the telegraph train at Roorkee, some men of the sappers and miners being kept constantly practiced in the use of the instruments," shows plainly how well he understood its importance, especially as he had found on trial that the signals given by the mirror "are clear and satisfactory, and that they can be easily read in ordinary weather without telescopes up to fifty miles." It was these instruments and these trained signalers that permitted the Indian army to take immediate advantage of the heliograph, first of all in the Afridi war, in 1877–78, and next in the recent Afghan campaign. The code of signals, although of a tolerably simple nature, can only be read with ease by trained observers, and this General Roberts fully understood when he pointed out the necessity of "men of the sappers and miners being kept constantly practiced" in the use of the heliograph. The Mance heliograph is now not only an important item of equipment in the English Indian army, but has been employed to some advantage in Zulu-land; and it is but the other day that a further dispatch of twelve instruments was made to the cape. Sending signals by means of reflected light is no novelty, but the construction of a simple apparatus that can be put into

communication with a station fifty miles off without the least difficulty, and permits a message to be sent at the rate of ten to twelve words a minute, cannot but be regarded as an innovation in army signaling. It is but two years since the United States forces captured a tribe of Indians,—the Nez Perces,—of whom the chief is said to have carried a looking-glass, "used to direct military manœuvres in battles by means of reflected rays of light. Their various significations, however, have never yet been found out by the white man," we are informed, though, whatever they were, they are not likely to have been very complicated. Signaling by mirror has been employed, too, for many years in Spain, and General Sir William Codrington tells us that when he was in Gibraltar, in 1835, Admiral Sheriff, who was then in naval command at "the rock," used to communicate to a friend at Tangiers, right across the Mediterranean, by flashes. Admiral Sheriff employed for the purpose a simple toilet looking-glass, and the signals he was in the habit of sending were read and immediately answered by his friend on the other side of the straits. In the Crimean war it was stated that a system of mirror telegraphy existed in Sebastopol, and from the British lines the working of this apparatus could frequently be seen.

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A POWERFUL NAVY NOT DANGEROUS TO CIVIL LIBERTY.

WHEN the Congress of Paris of 1856 issued the famous declaration which abolished privateering, all the maritime countries of Europe, great and small, hastened to express their intention of adhering to the four principles contained in it. But the United States government, with more deliberation, and certainly with far greater wisdom, declined to enter into the compact unless the first principle of the declaration, to wit, "Privateering is and remains abolished," should be amended by adding, "And that the private property of the subjects, or citizens, of a belligerent on the high seas shall be exempted from seizure by public armed vessels of the other belligerent, except it be contraband." Otherwise, it was argued, the states which maintained small naval forces would be at the mercy of those which maintained large ones. The views of the United States government, as expressed by the Secretary of State, Mr. William L. Marcy, in his letter to the Count de Sartiges, under date of July 28, 1856, were so sound and logical that they at once received the commendation of some of the leading powers of Europe, notably that of Russia, and have been deemed by publicists generally as unanswerable. But this letter, admirable as it is as a whole, contains an expression so peculiarly calculated to mislead the casual reader as to require some notice at our hands. It is this expression indeed, probably flung out in the heat of the moment, which forms the key to our present essay, to which the preceding remarks are merely prefatory.

Mr. Marcy says, "The United States consider powerful navies and large standing armies, as permanent establishments, to be detrimental to national prosperity and dangerous to civil liberty. The expense of keeping them up is burdensome to the people." While we agree entirely with the general idea that it is contrary to the policy of our government to maintain a naval force large in proportion to our great and rapidly-increasing population, and our vast interests in ocean commerce, yet we must take exception to the confusion of ideas contained in the sentence just quoted. Mr. Marcy evidently intended the adverbial phrase, "dangerous to civil liberty," to apply to the maintenance of "large standing armies as permanent establishments," and did not intend it to qualify the possession of "powerful navies."

Powerful navies are *not* dangerous to civil liberty. This may be proved by the testimony of all history, both ancient and modern. One of the earliest navies known to authentic history, and at the same time one of the most respectable for its size and power, was that of Athens. At the battle of Salamis it proved itself equal to the great strain put upon its patriotism and valor. But while that battle is still pointed to by the naval student as illustrating certain great principles in the science of war, the political lessons to be drawn from it are even more suggestive. Won mainly through the instrumentality of the middle and lower classes, the enormous political value of the democracy in the great commercial centres, like Athens, hitherto unappreciated, became at once apparent to all Greece. Hence Mr. Grote has well styled the Athenian navy "the child and champion of Athenian democracy." It was the navy that, at one of the most important crises of her history, turned the tide in favor of the great democratic party in Athens; and it ever proved the bulwark of progress and civilization when threatened by the tyrants of the East. It was only when the virus of political corruption had eaten into the heart of the state itself that it found its way into the last stronghold of patriotism,—the fleet; and when that fell, Athens and her pristine glory fell with it! No people of antiquity were more jealous of their liberties than the Athenians, and yet we read in the speeches of Pericles nothing but words of congratulation in regard to the power and achievements of their fleet.

The sailor has always been true and loyal. When Cambyses resolved to make war upon Carthage, the Phœnicians, who formed the strength of his fleet, refused to serve against their countrymen, thus compelling that great prince to abandon his design. While in the meridian of her power, the republic of Carthage maintained the most numerous fleets then known, and she continued to flourish until those fleets were overcome by the rising naval power of Rome. As soon as these faithful guardians of her shores were vanquished, Carthage herself succumbed to the legions of Rome.

"The Roman fleet," says Mommsen, speaking of republican Rome, "with its unwieldy grandeur, was the noblest creation of genius in this war,"—the first Punic; and as at its beginning, so also at its close it was the navy that inclined the great issues of war in favor of democratic Rome. After the fleet of Mark Antony had been annihilated at Actium the naval forces of Rome were largely increased, but it would be difficult to find a single indication of jealousy of its great power on the part of the people.

The navies of antiquity are especially cited, for the reason that no very broad line of demarcation separated, in those early days, the land army from the sea army. Thus Miltiades, the hero of Marathon, subsequently commanded the Greek fleet; and Pausanias, who defeated the Persians at Platæa, afterwards commanded as admiral in the Hel-

lespont. Aristides, Alcibiades, Cimon, and many other distinguished Greeks, fought with marked ability both on shore and afloat, as did also the great Carthaginian and Roman leaders. If, then, a powerful fleet is dangerous to civil liberty, some proof, however slight, would surely be furnished by the history of republics at a period when the distinction between the two forces was so faintly defined. But the example is wanting of a navy of antiquity subverting the supreme power of the state.

The same may be predicated of the navies of the Middle Ages and of modern times. Coligny, admiral of France in 1552, had been a colonel of infantry, and had distinguished himself as a soldier. Blake, Popham, and Deane, three colonels of the army, subsequently held commands in the English fleet as flag-officers. The Duke of York, afterwards James II., received a military training under Turenne, and served with distinction in the campaigns in France and Spain, yet he afterwards commanded the fleet of England with remarkable success. As lord high admiral he had absolute control of the entire naval force of England, yet no history of that time contains a hint that he wielded a dangerous power by virtue of his high office. From the time of King John and Magna Charta, even during periods when Englishmen have been most sensitive in regard to their civil liberties, they have continued steadily and surely to foster and increase their naval power.

Sir William Blackstone calls the navy of England the floating bulwark of the island; "an army," he says, "from which, however strong and powerful, no danger can ever be apprehended to liberty; and accordingly, it has ever been assiduously cultivated, even from the earliest ages." This opinion is re-echoed by Baron Macaulay. Referring to the time of Charles II., he says, "If the jealousy of the Parliament and of the nation made it impossible for the king to maintain a formidable standing army, no similar impediment prevented him from making England the first maritime power. Both Whigs and Tories were ready to applaud every step tending to increase the efficiency of that force, which, while it was the best protection of the island against foreign enemies, was powerless against civil liberty. Ever since the Restoration, the Commons, even when most discontented and most parsimonious, had always been bountiful even to profusion where the interests of the navy were concerned."

As the art of navigation improved, and commerce spread itself more and more to distant seas, the navy gradually assumed the importance of a distinct profession. Officers and seamen were now reared from their tenderest years to the privations of ship-life and the perils of the sea. Long and arduous voyages softened every recollection of home, and their return found them with an increased devotion to their native land. Hence, from the very nature of his calling, the seaman, far removed from civil strife, learned more thoroughly than any other class of citizens to revere the flag under which he sailed, and to which he proudly

pointed on distant shores as the symbol of his country. Whatever apprehensions of danger, therefore, may have existed under the old system, they must certainly have disappeared under the new.

The great Admiral Blake well expressed the sentiment natural to a navy when, after the death of Charles I., he said to his seamen, "It is still our duty to fight for our country, into whatsoever hands the government may fall." Even during the great mutiny of the Nore, where the whole British fleet had been forced by oppression into a hostile attitude towards the government, the seamen, while insisting upon their rights, declared their readiness to go out whenever called upon to fight the French.

In our own time and country it is believed that there can be found no authoritative declaration opposed to the maintenance of a navy proportioned to our ocean commerce. Washington, when President, urged upon Congress the policy of maintaining an efficient navy as a means of vindicating the nationality of the flag and insuring the preservation of peace. The safety of a navy lies in the loyalty of the seaman to his flag. Fenimore Cooper furnishes some strong testimony on this point. Speaking of the affairs of the colonies, he observes: "It has been said that the gentry of the country had begun to place their sons in the British marine previously to the commencement of the war of the Revolution; but while many instances occurred in which Americans threw up their commissions in the British army in preference to serving against their native land, very few of those who had taken service in the navy followed their example. The second nature which the seaman acquires in time appears to have drawn the cord too tight to suffer it to be snapped even by the violent struggle of a civil war; and most of the young men who were born in the colonies, and who found themselves arrayed against their proper country on board the ships of the king, continued to serve with the undiminished zeal and singleness of purpose that is apt to distinguish the fidelity of a seaman to his flag."

While our people were still fresh in the enjoyment of their liberties, we find, in the report of the House Naval Committee, under date of November 27, 1812, the following beautiful tribute to the loyalty of our seamen: "It is with something like exultation," say the committee, "that we present a species of national force (the navy) that, whilst it will best subserve the national defense, can operate least on national liberty. It is a bright attribute in the history of the sailor that he has never destroyed the rights of the nation. In its defense only is he to be found." In the exhaustive discussion which took place in 1836 on the subject of our national defenses, General Cass, then Secretary of War, laid great stress on the necessity of a naval force, which, according to his views, should have been much larger than it then was. This opinion was indorsed by the high authority of General Jackson. "It seems to me," General Cass remarks in his letter to the President, under

date of April 7, 1836, "that our first and best fortification is the navy. Nor do I see any limit to our naval preparations, except that imposed by a due regard to the public revenues from time to time, and by the probable condition of other maritime nations." "No well-directed effort," said the late Mr. Secretary Welles, "should be spared to increase our naval strength; for it is mainly on the ocean that our rightful position as a nation is to be secured and maintained. The sailor is always and everywhere true to his flag."

We think we have fully established the soundness of our proposition. It only remains now to examine the latter part of the clause quoted from Mr. Marcy's letter: "The expense of keeping them up is burdensome to the people." The cost of our navy does not necessarily fall upon the tax-payers. So long ago as 1812 it was proposed to set apart for the support of the navy one-third of the revenues derived from commerce. Considering the close relations and mutual dependence existing between the national and the commercial marine, there is a degree of propriety in the suggestion which cannot fail to commend it to the legislator. An efficient navy, by preventing war, saves commerce. A navy polices the seas, keeping down piracy and the impressment of seamen. It pushes the work of discovery, hydrography, and astronomy to distant seas, and reduces the dangers of navigation. It gives countenance and confidence to our merchants doing business in foreign ports, and furnishes a moral support, rarely appreciated at home, to our ministers, consuls, and other representatives abroad. On the other hand the navy recruits very largely from the mercantile marine, and in it would be found in time of war its best reserves of seamen.

By the last official returns the revenue derived from commerce (taking the average for the ten years last past) amounted, in round numbers, to one hundred and seventy-one millions of dollars annually. Deducting six millions for expenses of collecting, there are left one hundred and sixty-five millions, one-third of which—fifty-five millions—would be more than sufficient to maintain "a powerful navy." But for the past ten years our naval expenditures have averaged only about twenty-one millions. If we were to revive the "gradual-increase act" of 1819, and set apart from the customs three millions annually to be devoted to the setting up of ships of modern design, making an annual expenditure of twenty-four millions,—less than one-sixth of the customs' receipts,—our navy would soon regain the position, on a peace establishment, of respectability it once enjoyed, and the expense would not be "burdensome to the people."

Thus we may see that neither on political, military, or financial grounds is there any sound reason why our navy should have been suffered to run down to its present "low ebb," to use the statement of Mr. Secretary Robeson.

S. B. LUCE, *Captain U. S. Navy.*

INCIDENTS OF THE RECENT CAMPAIGN AGAINST THE UTES.

CONCERNING the engagement fought September 29 last, in Western Colorado, between three companies of United States cavalry and several hundred Ute Indians, some things have been written that are true and many more that are the merest fiction. The writer entertains no hope of disabusing the public mind of the many erroneous impressions of that affair conveyed through the columns of the daily and illustrated press. That, indeed, were a useless task, and this paper is ventured simply with the desire of laying before the military readers of THE UNITED SERVICE magazine a narrative of events, beginning with the departure of the White River expedition from Fort Fred Steele, Wyoming, September 21, 1879, and concluding with the relief of the besieged command by General Merritt, colonel of the Fifth Cavalry, at daybreak of October 5. The command was composed of three troops of cavalry, "E" of the Third, and "D" and "F" of the Fifth, and one company of infantry, "E" of the Fourth; the total fighting strength being about one hundred and eighty men. A train of twenty-five wagons accompanied us, upon which rations and grain for thirty days were transported.

The officers with the expedition were Major T. T. Thornburgh, Fourth Infantry, commanding; Lieutenant S. A. Cherry, Fifth Cavalry, adjutant; Lieutenant S. A. Wolf, Fourth Infantry, quartermaster and commissary; Dr. R. B. Grimes, acting assistant surgeon, U.S.A., surgeon; Captain J. S. Payne and Lieutenant J. V. S. Paddock, Fifth Cavalry; Captain Joseph Lawson, Third Cavalry; and Lieutenant B. D. Price, Fourth Infantry; the four last named being company commanders. The expedition left Fort Steele Sunday morning, September 21, and after a dusty march of fifteen miles over the high, rolling plateau lying between the post and Rawlins, reached that place during the early afternoon, and went into camp for the night. This town, which has a population of perhaps eight hundred souls, is situated in a cleft of the Rocky Mountains, and presents, when seen from a distant point, quite a picturesque appearance. The Union Pacific Railroad Company have located machine-shops here, and it is the point from which supplies are shipped by wagon transportation to the Indians at

White River agency, and to Fort Washakie, a military post in Northwestern Wyoming. In its earlier days it was, in Western phrase, a "live town," with all the term implies; but quiet times have long ago come to Rawlins, and its people, mostly railroad mechanics, are law-abiding and industrious.

At dawn of the 22d we were in the saddle and on our way to the agency over a road which, taking a course nearly due south, traverses a country unequaled for dreariness of aspect, and so far as the observer can determine utterly unfit either for pastoral or agricultural pursuits. Sage-bush, filling the air with its pungent odor and covering the ground so thickly as to render travel almost impossible except over the well-beaten trail, is the only vegetation to be seen, and no stream is reached until one arrives at Mud Spring, where pure, clear water is found bubbling out of the top of a knoll, and running down is soon lost in a little valley, which, covered with nutritious grass, is the only spot of verdure on which the eye has feasted during a day's weary march. The country around Mud Spring is very rugged and picturesque. The little valley soon narrows to a canyon whose winding course the road follows for several miles, the hills on either side being precipitous with ledges of sandstone standing out in bold relief, while the foothills extend far away until lost to the south and east in the mountains, whose summits, crowned with foliage already rich in autumnal tints, afford vistas of rare and exquisite beauty. At Lambert's ranch, twenty-eight miles from Rawlins, the road crosses the old emigrant route to California, and leaving the canyon ascends a high hill, over which it winds to Willow Springs, where the eye is delighted to see trees in leaf and green grass, and the ear to catch the sound of running water.

We have now passed the great "divide" of the continent, the watershed to our right sending its contributions to the Pacific through Snake River, whilst the streams on the left reach the Atlantic by the North Platte. The road passes along through sage-bush and sand, with lofty mountains on either side and the Bear River chain stretching across the southern horizon in billowy outline, first discernible through the dreamy haze that falls like a veil over the landscape. There was little to charm the eye in the foreground of the picture; but the distant expanse brought near by the foreshortening touch of the dry, rare atmosphere presented one of those magnificent prospects for which the North American cordilleras are noted. Leaving the plateau over which it has run for seven miles, the road makes a sudden turn to the right, and, descending into the valley of Mud Creek, follows that stream over alkali flats and through sage-bush and greaseweed for eighteen miles, until its confluence with Snake River is reached. Here we found several ranches, a trading-store, small tracts of land under fence and cultivation, and large herds of fat cattle browsing in the valley or sunning themselves on the slopes of the hills. The river, a clear,

rapid, sparkling mountain stream, skirted with a heavy growth of cottonwood timber, is named from its serpentine course, and winds through a charming valley, narrow and productive,—a very strip of fertility in a region sterile and desolate.

After leaving Snake River and crossing the Colorado-Wyoming boundary line, two miles out, our route lay to the southwest over rolling ground, from which we observed for the first time heavy clouds of smoke ascending from fires set by the Indians in the mountains on our left. This, with the *débris* of tepees and traces of recent Indian campfires, easily distinguishable from those lighted by white men, reminded us that we were indeed approaching the land of the Utes. These evidences of the propinquity of the gentle savage excited, at the time, no apprehensions of trouble, as for months past the grass and timber-lands of Northern Colorado had been burning, and vast volumes of smoke, borne before the prevailing winds from the west, had been drifting across the Medicine Bow range and hanging like a pall over the plains at the eastern base of the Rocky Mountains.

Fortification Creek we found a pretty stream, issuing from a bold, picturesque canyon, with fringes of willows along its banks, the water excellent, and the grass in the valley nutritious and abundant.

Leaving Price with his company of infantry to establish a supply-camp at this point, the command resumed its march next morning, and followed Fortification Creek for eighteen miles, crossing and recrossing it several times, and at two o'clock in the afternoon went into camp in the fertile and beautiful valley of Bear—or, as the Indians call it, the Yampah—River. Here, again, we found ranches, herds of cattle and horses, and other reminders of frontier settlement.

We were now in the very confines of the neutral territory lying between the white settlements and the Ute reservation, and, as our first acquaintance with members of this tribe was formed in our camp on the Yampah, a digression may be indulged in at this point, in order that attention may be called to some incidents of our interview.

The Indians visiting us here were Saarwick, a chief of prominence, "Ute" Jack, a sub-chief, Unque, an Uncompahgre who had a pass from the agent at Los Pinos, in which he was represented as being a good Indian, and several others whose names I cannot recall. Jack, who, were he a white man, would take to politics, has for a long time been an agitator and stirrer-up of strife. Endowed with the powers of oratory,—erroneously supposed to be a gift not at all rare among Indians,—a good judge of savage character, and ambitious of reaching that eminence in his tribe for which he fancied himself fitted by nature and education, he has been, for a year or more gone by, endeavoring to arouse a feeling of distrust among his people, well knowing that by catering to their taste for blood the avenue to success would be opened. For the accomplishment of his ends he brought every art to

bear, and finally has succeeded in bringing about an Indian war which has set the border ablaze and aroused in the public mind and conscience a feeling of deep resentment against his race. He talked quite freely with us, using broken but easily-understood English, telling us of his travels in the East, and the impressions made upon his mind by the great cities he had visited and the multitudes of people he had seen, his standard of excellence for each place being the theatre. When asked how he liked New York, his reply was laconic and expressive: "New York pretty good; pretty good theatre in New York;" and so on through the list, varying the adjective to suit the impressions made by the performances he had witnessed in different cities.

Although apparently friendly it was evident that his mind was not at ease, for while conversing upon any topic he would turn suddenly to some one of the officers and ask, "What you come for? What's the matter? What soldiers going to do?" and notwithstanding assurances of our pacific intentions, and despite our most engaging efforts to divert his mind from a subject on which it morbidly dwelt, with that distrust which is so marked and prominent a trait of Indian character he would revert to it and ask the same questions over and over again.

When speaking of Mr. Meeker, the agent at White River, he was very abusive, and when asked what Mr. Meeker had done or failed to do, he said the agent had promised him a wagon "with a heap of red paint on it," but the one offered him he had indignantly rejected because of the want of lurid embellishment so attractive to the savage eye. What a cause for bloody war, and what a commentary on all efforts to bring these barbarous people under the influences and forces of civilization!

It is easy to see, in the light of experience, that the Indian problem is one whose solution presents many difficulties. The great trouble is to be found in the teachings of men,—benevolent, but totally ignorant of the subject with which they are dealing,—who, in a spirit of evangelism, desire to civilize the savage by filling his stomach with food and his heart with religion, both processes to be carried on without the constant presence of force, the only thing for which the Indian entertains respect.

The truth is, that by force and force alone, tempered, to be sure, by mercy, but that mercy exercised judiciously and sparingly, can his wild nature be kept under control. But persons clinging to the evangelical theory are active and make proselytes among various classes of people, thus smothering public opinion and creating for the red man a sympathy entirely undeserved. Sentimentalists, whose ideas of aboriginal character are derived from Cooper's novels, have here an object on which to expend that surplus of inexpensive sympathy with which such natures are endowed, and those philanthropists whose charity is too far-reaching to fall within the horizon of the communities in which they live find

an opportunity to make a display of their virtuous opinions, at once ostentatious and cheap. These humanitarians (?) complacently gaze—safely from afar off—at slaughtered officers and men, and hear unmoved of murdered children and outraged women; but let the savages be thoroughly punished for their acts of atrocity and the vials of wrath are opened upon the heads of the military. Better fifty dead officers and soldiers and nameless outrage to a score of women than one Indian corpse.

Many reasons for the outbreak of the White River Utes have been given. The encroachments of the miners may have had some effect, the effort of the agent to make them tillers of the soil doubtless had its influence; but the real cause goes back of all minor troubles and is to be found in the Indian's thirst for blood and love of rapine.

Be their reasons never so good, there can be no excuse for their treachery before the beginning of hostilities. They came to us, not "as an army with banners," their feathered plumes waving in the autumn breezes, their trappings gleaming with barbaric splendor, and their arms glinting back the bright rays of the sun, thus giving warning of their hostile intent and throwing the gage of battle at our feet; but with duplicity in their hearts whilst their countenances wore the signals of peace, they visited our camps, professed friendship, and, having learned our force, departed, feeling no doubt full assurance of an early massacre, a species of amusement which commends itself to aboriginal minds as the most pleasurable of innocent and fanciful pursuits.

After leaving Bear River the country improves greatly, and eight miles from the crossing the road enters one of the most beautiful canyons I have ever seen. Through this it winds for four miles, constantly ascending, with sierra after sierra bursting into view, until the crest of the "divide" between the Yampah and Williams Fort is reached. Thence it descends for an equal distance, the canyon narrowing until it debouches into an exquisite valley three to five hundred yards wide, through which courses the sparkling stream last named. The scenery here was full of wild beauty. The mountains, springing from the vale abruptly to an altitude of a thousand feet above the creek bed, were covered with cedars, spruce, and lichens; the banks of the stream were fringed with willows, and the grass in the valley grew luxuriantly. Here we camped on the night of the 27th, and received a visit from "Colorado," a White River chief of bad reputation, "Henry," the agency interpreter, and three other Indians who came in from the agency with Mr. Estridge, an employee, who had been sent by Mr. Meeker with a communication to Major Thornburgh. These Indians were not disposed to be sociable at first, but their reserve seemed to wear off, and they laughed and talked among themselves, listening the while to whatever was said by any of the officers; for be it known that among these people it is unusual to find one who does

not understand the English tongue sufficiently well to catch the drift of conversation on any subject with which they are familiar. Colorado was exceedingly surly, shaking hands with little cordiality, and in response to an invitation to smoke, saying, "Colorado big chief, no sabe smoke pipe;" a remark which we interpreted at the time as conveying a rebuke for our want of hospitality in offering an individual of his power and celebrity anything less excellent than a *Reina Victoria*. However, we had no Havanas left; for his fellow-citizen Jack, when offered one the night before, had shown his high appreciation of our courtesy by taking every cigar in the only box our mess possessed.

From Williams Fort the road, still going south, enters the canyon of a small mountain rivulet, and at a distance of three miles bears sharply off to the right, when in a pretty little park we found several sweet springs overhung by masses of red sandstone, in some places eroded by the action of wind and water into forms of fantastic beauty; in others piled, rock upon rock, in inextricable confusion, as if the Titans had been playing at bowls in the long, long ago. On our right a mountain, grim, brown, bare, rose to an altitude of three thousand feet; on the left the peaks shot skyward, their crests wearing the foliated aspect of cathedral spires, and the feathery plumes of smoke from the burning timber floating between us and the sun were beautiful with the tints of golden bronze.

The "divide" was crossed at an altitude of eight thousand feet, and we camped two miles from the top in a fine canyon, where good water and grass were found for our animals. My beautiful bays! how little did we think you were bearing brave men to death, and that, ere the shades of another night should lower, "stable-call" would have no music for your ears!

We left camp at 6.30 A.M. of the 29th and emerged from the gloom of the canyon just as the first pencils of sunlight were gilding a lofty pinnacle, surmounted with a leaning rock so strikingly resembling a woman's form that one could almost fancy it an Olympian Venus bending down to kiss an earthly lover lying in the quaint, tender shadows at her feet.

At 9.30 we reached the high ground overlooking Milk River. Descending the hill, a fine landscape lay before us. A small stream running softly down a narrow valley; on the right hand, a mile off, a line of bluffs continuous and inaccessible, with broken ridges nearer the creek; on the left rounded knolls and what our English friends call "downs," furrowed with *arroyos* and running back to the high hills which form the advance guard of the White River Mountains. The air was soft and balmy as with the breath of the sweet south, and the bright sunshine shooting in broad flashes across the hill-tops filled the valley as with liquid gold. Save in the long column which, dis-

mounted, was winding its way down the hill, not a living creature was in sight. Earth and sky were fair to behold, and the pictured calm seemed the very symbol of peace.

The command was halted and the horses watered at the river, after which the march was resumed, "E" troop of the Third Cavalry and "F" of the Fifth proceeding, under the immediate command of Major Thornburgh, while "D" of the Fifth remained with the wagons.

Following the river for a thousand yards, the troops crossed and took a trail going over the hills to the left, with the view of cutting off the elbow made by the road. A good deal of nonsense has been written in the newspapers to the effect that the command pursued this route by the advice of a guide, who, knowing the Indians were lying in ambush in the canyon, took us this way to avoid annihilation. Major Thornburgh turned off the road to shorten his march. Neither he nor I were apprehensive of trouble at this time, and the first intimation of it came from Lieutenant Cherry, who with the advance guard had proceeded over some high ground between the trail and road, and had discovered the Indians drawn up in line of battle, or, more correctly speaking, lying in ambush along the ridges which covered and commanded the road.

With a quick and soldierly perception of the situation, Lieutenant Cherry turned back and made signals for the command to retrace its steps just as the leading company ("F," Fifth Cavalry) was descending the ridge into the valley beyond. Company F was immediately conducted to the side of the hill on its left flank, while "E," Third Cavalry, was halted on the high ground it occupied, and both companies at once dismounted and deployed, by Major Thornburgh's orders, as skirmishers, "E," Third Cavalry, on the right, along the crest of the ridge, and "F" Company, Fifth Cavalry, as well up the side of the hill, which, constantly ascending, stretched away indefinitely, as the nature of the ground would permit. Our line at this time resembled the letter V, the point towards the Indians, and that portion of it formed by "F" Company, Fifth Cavalry, projecting considerably beyond the point of junction and being deflected to the left so as to prevent the enemy from turning our flank. At this time attempts were made by Major Thornburgh in person, and by Lieutenant Cherry, to communicate with the Indians, but efforts in that direction were met by a shot, and at once a hot fire was opened upon us, and the fight began all along our lines. The Indians had displayed admirable skill in the selection of the ground upon which to give us battle. We were enveloped by high hills from which they were enabled to pour a plunging fire upon us whilst they were enabled to keep well under cover, and it soon became evident that our position, in the face of an enemy greatly superior in numerical force and superbly armed, was untenable. In the exercise of sound judgment and a perfect appreciation of the situation, Major

Thornburgh determined to make a junction with the troop at the train, and with that object in view directed the companies engaged to retire slowly. In the mean time a hot fight had been raging, two men of my company being killed and a number wounded at other parts of the line. The command retired as directed in perfect order, the led horses being well protected between the skirmish lines of the two companies, while a heavy and effective fire did great execution among the savages, and prevented an attempt on their part to break through our lines. Failing in their efforts in front, the Indians endeavored to cut the command off from the train, which had, by Major Thornburgh's order, gone into park on the right bank of Milk River, and to accomplish this purpose passed around our left flank, beyond carbine range, and concentrated in great force upon a knoll to the left of us and completely commanding our line of retreat. Major Thornburgh, upon discovering this new danger, directed me to charge the knoll with twenty men of my company, to sweep the Indians off, and then at once, without attempting to hold the hill, to fall back upon the train and take measures for its protection. This duty being performed and a way opened for the return of the led horses, I repaired to the wagon train and at once took steps looking to its defense.

Major Thornburgh no doubt started for the train just after giving me the order referred to, and was killed after crossing the creek, and within five hundred yards of the wagons. He saw but three-quarters of an hour of the fight, but during this brief period displayed his ability to command, and that superb courage under fire which always inspires confidence and admiration. He was one of nature's noblemen, simple, frank, and generous. He leaves a heritage of honor to wife, children, and brother, and to the army an example worthy of emulation. I trust I may be pardoned for referring here to an incident personal to myself; but as it illustrates the quiet heroism of two humble men, one living, the other dead, I cannot pass it by unnoticed. When charging the knoll to which I have referred, my horse was shot, and falling, broke his girth and threw me violently to the earth. When I got to my feet I saw that my detachment had swept over the hill, and was rapidly disappearing in clouds of dust and smoke. Just as I discovered an Indian within fifty yards of me,—I was completely at his mercy, having neither gun nor pistol,—First-Sergeant Dolan, of my company, who had missed me from his side, turned back, and dismounting, offered me his horse. Brave old man! all unconscious of the heroism of his act, he thought not of his own but of his captain's safety. He died, as a brave man would choose to die, two hours later, but not until I had thanked him for the offer I could not accept. As it was, he would not leave my side until a gallant young recruit, named Carpenter, brought me a led horse, when we three left for the corral together. While these events were taking place, Captain Lawson, with "E" Company, Third

Cavalry, and Lieutenant Cherry, with a detachment from "E" Company, Third, and "F," Fifth Cavalry, gallantly held the Indians in check in front, gradually retiring, Lieutenant Cherry, with his detachment, covering the retreat. Upon reaching the train I found it parked on the right bank of Milk River, about two hundred yards from the water, the wagons forming the north side of a corral elliptical in shape, its long axis running east and west, and the south side exposed to a fierce fire from the Indians, who, massing in ravines along the river and upon commanding heights, were making a determined effort to capture and destroy the train before it could be placed in position for defense. The animals were crowded within the area indicated, and I at once directed some twenty or more of those wounded to be led out and shot, along the open space referred to, thus making a continuous line of defense, and affording cover for our sharpshooters.

The wagons were now unloaded, and bundles of bedding, grain and flour sacks, and mess boxes were used for the construction of breastworks. About this time Lieutenant Paddock, who displayed in this his maiden fight the intrepidity of a veteran, was painfully wounded in the hip, and I received through the left arm a gentle hint that the enemy were not disposed to discontinue their attentions.

Captain Lawson and Lieutenant Cherry, with their commands, had now reached the corral, and we were entertaining the hope that our greatest danger was passed, when a new and startling peril threatened us. The savages, disappointed in their efforts to prevent the concentration of the command at the train or to drive us into the open field, where certain death awaited, took advantage of a high wind blowing towards the corral and set fire to the dry grass and sage-bush down the river.

At the moment this danger was realized, we observed that the Indian supply-train, which we had passed on the hill a mile back on the road, was parked within seventy-five yards of our position, and so situated as to command the approach to water. Apprehensive that the Indians might, under cover of the smoke, make a lodgment in this train, and with the further purpose of burning the grass on the north side of the corral, so as to present as little surface as possible to the Indian fire when it should approach, orders were given to fire the grass on that side; and in a few minutes we were gratified to see Gordon's train in flames. The fire from below was now approaching with frightful rapidity, volumes of black smoke rolling before it, through which the angry, lurid tongues of flame shot high into the air, giving to the scene an aspect appalling and grand.

Now the fire reached the exposed salient of the corral; some of the wagons were set on fire, and the utmost effort was required to extinguish the flames. At this critical juncture the Indians made their most furious attack. Not one could be seen, but the incessant crack

of their rifles dealt destruction to man and beast. In every ravine the red devils were lurking, and from every sage-bush came the messenger of death.

The fire extinguished, our greatest peril passed, but the danger had been averted at great loss. Wagon-master McKinstry, Teamster Maguire, Sergeant Dolan, and Private McKee, of my company, and Private Mooney, of "D" Company, were killed, and not less than a dozen men wounded. It was now that Dr. Grimes was shot whilst gallantly ministering to the wounded, and I received my second reminder of Indian malignity.

From this time—about 2.45 P.M.—until nightfall the Indians kept up a furious fire, doing great damage to our stock, fully three-fourths of them being killed, or so severely wounded that they were killed by my order. At dark a large body of Indians charged down beyond Gordon's burning train, delivering volley after volley. They were repulsed easily, and fled, suffering a loss of several warriors, who were distinctly seen to drop from their saddles.

When night had come and we were enabled to look our situation in the face, the prospect, though certainly unpleasant, was not discouraging. We had thirty days' rations, were within two hundred yards of water, and although we had lost our gallant commander and two men killed in the fight in the field and ten more in the corral, besides having forty-two wounded to look after, we had ninety brave fellows unhurt, and felt confident of holding out until succor should come.

During the night the dead animals were removed, a full supply of water was procured for twenty-four hours, the wounded were cared for, intrenchments were dug, and by daylight the corral was in good condition for defense.

Couriers had been sent out at midnight with dispatches to the military authorities, ammunition and rations distributed in the several trenches, and that sense of security was felt for the command which sprang from a knowledge of its gallantry and fortitude. Next day the Indians kept up an almost incessant fire, killing nearly all our animals, but doing no other damage. We were unmolested during the night of the 30th, but after that time the enemy gave us no rest. On the night of October 1, our water-party was fired on at short range, and one man shot in the face. The guard for the water-party returned this fire, killing one savage.

At daylight of October 2, Captain Dodge and Lieutenant Hughes, with "D" Company, Ninth Cavalry, came into our camp, the first intimation of their approach being given by an Indian lying in the ravine, who called out, as a warning, no doubt, to his copper-colored companions, "Soldiers coming." Recognizing the voice as that of a savage, the men were directed to lie low and keep a sharp look-out, as we suspected the alarm was a ruse to get the troops out of the trenches,

in order that the enemy might fire upon them from their places of concealment. In a few minutes, however, brave John Gordon, who had with Rankin and Corporals Moquin and Murphy taken out dispatches at midnight of the 29th of September, called to us in his cheery tones, and he and his companions were admitted.

We had now a material addition to our fighting force, and heard with joy that our courier had gone through with safety. No words can convey our sense of appreciation of the gallantry of Captain Dodge and his command; but it is gratifying to know that from their superiors and the public they have received the praise such courage deserves.

All this time our minds were full of conjectures as to the fate of the people at the agency. We feared the worst for all concerned; but the savages, as afterwards learned, having wreaked their vengeance upon the agent and all male employees, made captives of the women and children. This can hardly be attributed to any feeling of humanity in the breasts of the Indians in general, but is doubtless due to the influence of Ouray, principal chief of the Ute nation and immediate head of the Uncompahgres,—*Anglice*, Incomparables. He is a man of marked ability, and realizing the necessity for his people to be on good terms with the whites has always exerted his influence, hitherto potential, on the side of peace, and his recent efforts to avert war when imminent, and to stop it when flagrant, furnish abundant evidence of his sincere desire to accommodate himself and his followers to the changed condition of affairs brought about by their restriction to a limited territory and their dependence upon the government for subsistence. His friendship for the white people has made him unpopular with some of his tribe, and his life has been attempted more than once. Through all, however, he has remained firm, and to his power, exerted through his family connection, the females and children captured at White River owe their lives. Susan, wife of Johnson, a White River chief and sister to Ouray, was the fast friend of these unfortunates from the moment of their capture. Her appeals to her husband made him their friend also, and by the interposition of these two the children were saved from death and the women from a fate nameless and more horrible. There is a flavor of romance in the devotion of this savage woman to her pale-face sisters; and the blackness of the page devoted to the crimes of her race will be illuminated by the story of her efforts to protect innocence and shield virtue.

The history of one day of the siege is the history of every other day, the monotony being varied only by the divers schemes for our annoyance evolved from the versatile brains of our neighbors. We were compelled to lie low, for the exposure of a head or arm would attract the fire of the Indians, and remind us that "the better part of valor is discretion." Fortunately the weather was fine. The beauty of the sky

day and night surpassed description, and some of the atmospheric effects were peculiarly striking. One day, as Captain Lawson and myself were lying in a rifle-pit, the mirage projected the whole valley against the heavens.

I was dozing, when an exclamation from the captain aroused me, and I saw the river-bottom reflected in the sky, and the intrenchments which had seemed so secure apparently exposed to an enfilading fire. So perfect was the illusion that one fancied for a moment the danger real and not imaginary. As we always expected to be fired on when the moon rose, we watched that spectacle with deep interest. The first shimmer of her borrowed light, caught by the hill-tops, would attract the attention of the Indians, and as the curtain of darkness would be uplifted and the flood of light stream over the landscape, they would gather in the shadowy ravines and pour volley after volley into the corral, the flashes from their rifles lighting up the dark places and lending to the scene an effect startling and weird.

Signal fires would during the nights from time to time burst into view, and the yells of the Indians holding their scalp dances, mingled with the howls of hundreds of coyotes, attracted by the decomposing animals, made the hours hideous with the discord of horrible sounds.

The stench arising from more than three hundred dead animals, lying within a hundred yards of us, was endurable by day, but at night, when the cold air descended into the pits, despite the fine training our olfactory nerves had received for this climax of bad smells which we all knew was approaching, the putrefying odor was almost stifling.

It was a sad sight to see these poor animals lying stark and cold under the stars, and recalled to mind Byron's description of the night of Sennacherib:

> "There lay the steed, with his nostril all wide,
> But from it there rolled not the breath of his pride;
> And the foam of his gasping was white on the turf,
> And cold as the spray of the rock-beaten surf."

One great cause of anxiety was the fear that the weather, variable and coquettish here as elsewhere, might change her mood, and, instead of sending us warm sunshine by day and bright nights, open the sluices of the heavens and rain upon our uncovered heads from the abundance of her reservoirs; or that snow, which quite frequently falls at this altitude earlier than October, might descend, a calamity less to be dreaded than rain, only because we might have shaken it from our persons and thrown it out of the trenches as it fell. In our condition, without sufficient clothing, and without tents or wood, either of these misfortunes would greatly have augmented the sufferings of the command and taxed their patience and fortitude almost to the limits of

human endurance. Fortunately we were spared both calamities, and I pass from what might have been to resume the chronicle of what was.

Tragic as the affair had been, it had its comic side, and ludicrous incidents were frequent. When the men took advantage of a cessation of the fire from the hills to stretch their cramped limbs in the area of the intrenchments, the sharp reports of Winchester rifles and the vicious whiz of a bullet would suddenly divert their minds from the delights of perambulatory exercises and cause them, with an expedition seldom equaled on occasions of ceremony, "to seek that seclusion which a (rifle-pit) grants." They would clear the open space at a bound, and, jumping over the breastworks, enter the pits in most informal and indecorous style, much to the diversion of those of their comrades whose heads, bodies, and limbs escaped striking proof of their hasty coming. Every half-hour the time-call,—as, for instance, "Number one, ten o'clock, and all's well,"—starting from the pit in which Lieutenant Cherry and myself had selected our quarters, was repeated from trench to trench; but frequently the regular call would swell, before it made half its elliptical journey, into a verbal bulletin containing news from all parts of the globe, as well as editorial comments on our *status quo*. This was hardly in accordance with strict military usage, but neither was the siege; so, as far as this breach of the customs of service was involved, the rules were relaxed. Moreover, the half-hourly bulletins came back freighted with so much humor, sometimes dry, sometimes quaint, and again grim and loaded down with so many phrases damnatory of our savage enemies, that we heartily enjoyed the humorous part, and found the other so expressive of our own uncharitable anti-Ute views that no effort was made to suppress an inclination on the part of the men the indulgence of which, speaking liberally, was innocent and entertaining. Besides, our copper-colored opponents came down into the *arroyos* under safe cover of the banks, not fifty yards from the corral, and abused the entire command in the most vituperative terms. Having exhausted apparently in this vocal exercise the capabilities of the Ute dialect, they resorted to a language rich and copious in profane lore, and vociferated in English, hurling at us epithets which evinced a wonderful knowledge of the Anglo-Saxon tongue as a vehicle for one's disapprobation. Such phrases as these, "Come out with your cowardly cavalry and fight fair," and "We'll kill all soldiers pretty soon," were mild samples of their objurgations. There were many which would shock the sensibilities of your Eastern readers, but with which we on the frontier are familiar, for it is a deplorable fact that the white denizens of the border draw as freely upon the exchequer of English profanity as their red brethren.

We did not care much for this abuse, which at one time was personally directed to myself, whom the Indians called by name and subjected to a more terrible cursing than was ever leveled at the head of a

government mule. This, I confess, was a little exasperating, and although I did not myself reply in kind, I was greatly pleased to observe that I had some men in my command whose abilities in that line had never before been fully appreciated. Among the many valuables captured from our people by the Indians was an evening dress-suit (citizen's), the property of a young officer of the command. The story runs that it was brought along by his "striker" through mistake; but by those to whom his gallantry among the divine sex is as well known as his conspicuous courage under fire, this statement is taken *cum grano salis*. There be those who think he looks to the feminine possibilities of any place, and that when he started for the agency, with the probability of remaining all winter staring him in the face, he took his dress-suit in order to provide for all emergencies.

Two nights before the battle, when several of the Utes came into our camp, they were struck with the size of three of the officers, among them the one referred to, and I recall the fact that two of them—the interpreter "Henry," a magnificent-looking savage over six feet high, and another tall, vicious-looking rascal, whom the Indians, very happy in names indicative of character, called "Bummer Jim"—made these three officers stand up and measure statures. Is it not possible that even at that early moment they were taking the preliminary steps towards parceling out our apparel, having due regard for the accurate fit of the garments in which they were soon to display to admiring squaws the graces of their persons?

Be that as it may, they made extensive captures in that line of goods, and I have always fancied that in the distribution thereof the dress-suit fell to "Bummer Jim." What desecration! The shapely trowsers, which aforetime whisked over the waxed floor whilst the legs they encased were inspired by the sweet strains of music, to be "cut hostile," and that Hatfield coat, whose sleeve was wont to encompass palpitating and blushing beauty, to adorn a painted squaw!

The Indians found also in this officer's trunk a photograph of himself, and as a courteous acknowledgment of the acquaintance formed on the Yampah, left this picture lying on a stone, the top of it partly torn off, thus in savage style conveying the cheerful and assuring suggestion that, although they had been disappointed in their desire to have his scalp *in esse*, they still entertained hopes of it *in posse*. The commonly accepted belief that the Indian is under all circumstances a stoic is erroneous. He is a great joker, but his humor is of a sort which utterly fails to commend itself to the favorable consideration of the individual at whom it is directed. Of such a kind was the following remark addressed to us one day from the ravine: "Come out and harness up the rest of your mules for your own funeral." To men almost *in extremis* few things could have been said wherein grim humor and deep malignity could be more horribly combined.

The author of this cheerful suggestion was an artist in his way.

As we approached the boundary line of the reservation some one found hanging from a bush a sheet of paper, whereon were traced rude pictures of dead men, with innumerable and immense bullet-holes through them, and beneath, cabalistic characters running across the page after the manner of our writing. This riddle we failed to read at the time, but half an hour later we had no doubt of its interpretation.

Under all the circumstances the time did not drag as heavily as might be supposed. We had great faith in our early deliverance, for we knew neither man nor beast would be spared when General Merritt started to the rescue. During the Sioux campaign of '76, whilst Captain Price and myself were making a forced night march to overtake the general, then on his way to overtake General Crook, at three o'clock in the morning we reached a point where we expected to find Merritt's command. Seeing no sign of camp, and tired out with the fatigue of constant riding for twenty-four hours, we sounded the "officers' call" with the hope that our comrades might, if in the vicinity, indicate their presence by a reply. Greatly to our delight the response came, and the incident has passed into a regimental tradition.

While lying in the trenches on the night of the 4th of October this incident came to mind. Believing it *just* possible for General Merritt to reach us next morning, and knowing that, if possible, come he would, I directed one of my trumpeters to be on the alert for the expected signal.

And so it was. Just as the first gray of the dawn appeared, our listening ears caught the sound of "officers' call" breaking the silence of the morning and filling the valley with the sweetest music we had ever heard. Joyously the reply rang out from our corral, and the men rushing from the rifle-pits made the welkin ring with their glad cheers. Deliverance had come, and their fortitude and courage had met with reward.

The scene beggared description. Brave men wept, and it was touching to see the gallant fellows hovering around to get a look at the general whose name had been on their lips for days, and who, as they heard from their comrades just arrived, had risen from a bed of sickness to make a march unparalleled in military annals.

It was the relief of Lucknow in miniature; Isandula over again, this time in the mountains of Colorado. The drama had been full of interest and well sustained. Comedy and pathos had moved to laughter and melted to tears; Tragedy had stalked across the stage; and when the curtain fell upon the last act actors and audience were rejoiced that "the play had been played out."

NOTE.—The losses sustained by the troops in this bloody affair were proportionately greater than those suffered by either Federal or Confederate army in any

battle of the late civil war, and embraced more than one-third of the whole number of men engaged.

Of the seven officers, Major T. T. Thornburgh, Fourth Infantry, was killed, and Captain Payne, Lieutenant Paddock, and Acting Assistant Surgeon Grimes were wounded.

In Company F, Fifth Cavalry (Payne's), five enlisted men were killed and thirteen wounded; in Company D, Fifth Cavalry (Paddock's), three were killed and four wounded; and in "E," Third Cavalry (Lawson's), one was killed and seventeen were wounded. In addition to the above, one wagon-master, one teamster, and one guide were killed, and two teamsters and one employee of Mr. John Gordon were wounded. The number of Indians killed, as has been definitely ascertained, was thirty-seven. Many more were doubtless wounded, but of these there is no accurate report.

In no Indian fight of late years has so heavy a loss been inflicted upon the savages.

J. S. PAYNE,
Captain Fifth Cavalry.

EDITORIAL NOTES.

THE year 1879 may be written down in history as one rife with war and rumors of war. The "Eastern Question," which, for the past few years, has overshadowed all other questions in Europe, was merely prolonged, not settled, by the Treaty of Berlin, which will go down to posterity as one of the most remarkable makeshifts and most complete failures—as the next year will certainly prove—that the records of diplomacy can show. It decided nothing finally, as every one of the plenipotentiary signers thereof know; it only postponed, till every nation interested could more fully prepare for, that tremendous conflict and general "rectification" of frontiers which Europe is now feverishly awaiting. The truce—facetiously called definitive treaty of peace—which was signed by Russia and Turkey on the 8th of February was written merely that the non-fulfillment of some of its impossible conditions might give Russia a reasonable pretext to resume hostilities again whenever it pleased her to do so. The three emperors, while publicly professing the most sublime friendship for one another, are privately whetting their swords, neither one knowing on which of the other two he may first have occasion to use it. Italy, with the cry of *Italia irredenta* echoing through the Apennines, is waiting for Austria to become engaged in the East, to sweep down on those northern provinces which rightfully belong to the Latin, not the Teutonic, crown.

Great Britain has had more than her share of war and glory, such as it is. With Turkey in Europe, Egypt and Zulu Land in Africa, and Afghanistan, India, and Burmah in Asia on her hands, she has had all that the most belligerent of her sons could reasonably wish for. The war with Afghanistan has been the most serious of her complications. The British troops crossed the Afghan frontier November 21, 1878. A treaty of peace was signed with the Ameer Yakoob Khan May 26. In September the war again broke out by the killing of all the members of the British mission at Cabul. What the result of the campaign will be, it is not now easy to predict.

In South America war was declared between Chili on one side and Peru and Bolivia on the other, in March last. Two important naval fights have taken place between Chilian and Peruvian men-of-war, and a serious land battle has just been reported. Latest advices indicate

that Chili has now the advantage, and she may yet be able to dictate terms to her two opponents.

At home the troubles with the Cheyennes in January, with the Sioux in July, and with the Utes in October are the contributions of the year to our too-long list of Indian campaigns,—the only events to break our perfect peace with the world.

In erecting to the memory of Major-General George H. Thomas the magnificent equestrian statue which was unveiled at Washington on the 19th of November, the Society of the Army of the Cumberland paid a tribute not only to the man, but to manhood, for in nothing was General Thomas more pre-eminent than in the sturdy, sterling manliness of his character. He was not brilliant in the sense of giving forth fitful flashes that dazzle the more by reason of their dark and empty interspaces; the light he shed was the unflickering flame of persistence in duty, unswerved by temptation, undismayed by opposition. It was fitting that his statue should be placed, as it was, in a circle, so complete and rounded was the character it commemorates. There was a perfectness of co-operation in the moral, mental, and physical parts of his constitution which made the success of his undertakings the inevitable result of their inception. For him to plan a battle was to organize victory. No successful commander ever owed less to fortune. His sense of duty was too acute to permit him to leave to the arbitrament of chance anything for which human foresight could provide. The setting up a statue to such a man was rightly made a festal occasion; for the example he has left us, the memory of which that mighty bronze will perpetuate and enforce, is to us and to our children a priceless boon.

The unveiling of the Thomas statue brings to mind the fact that the projected memorial to General Meade is still unrealized. When we recall the immense interests which depended on the issue of the battle of Gettysburg, and how decisively the consummate ability of General Meade contributed to the great victory which crowned the Union arms, it certainly implies a reproach to the people of the whole North that no fitting monument has yet been erected to his memory. No one city or association should be expected, or permitted, to solely undertake the work. The mere announcement that a tribute so eminently deserved still lacks the necessary funds to compass its completion ought of itself to insure the immediate contribution of the required amount. We learn with pleasure that the Grand Army of the Republic, of the

Department of Pennsylvania, has taken the matter in hand, and that the Fairmount Park Art Association of Philadelphia, of which Mr. A. J. Drexel is president, and which has contributed five thousand dollars towards the fund, will act as depository of any contributions which may be offered.

THE details of the battle between the Peruvian ironclad "Huascar" and a Chilian fleet, on the 8th of October last, prove it to have been one of the most dramatic in naval history, and one worthy of more general notice than it has yet received. On the date named, the "Huascar," in company with the wooden corvette "Union," while steaming along the Bolivian coast, came in sight of a Chilian naval division, consisting of one ironclad and three other steamers. A few hours afterwards another Chilian division of the same strength hove in sight from an opposite direction, thus hemming the two Peruvian vessels in between the land and the enemy. As the "Union" could not aid her consort, and as it would be folly for her to risk a fight against overwhelming odds, she put on all steam and by skillful manœuvring escaped. The "Huascar" then headed in-shore for the bay of Mejillones, where the battle with her adversaries was fought. The Peruvian ironclad had only two 300-pound guns, while the Chilian ironclads, the "Alimirante Cochran" and the "Blanco Eucalada," each carried six 300-pounders, in addition to being just twice as heavily armored as the former. The fight lasted nearly two hours, the "Huascar" losing most of her officers and men, including the heroic Rear-Admiral Grau, and the Chilians received as their prize only a battered, almost worthless hulk. Our own naval history, bright as it is in deeds of unsurpassed heroism, unexampled conflicts, can offer nothing to rival this fight of the "Huascar" against hopeless odds, and Grau and his noble crew, who went down to certain death rather than surrender the vessel whose recent exploits had gained for her the admiration of the world, deserve to be enrolled among the greatest heroes of history.

WE note with much pleasure the increasing signs of improvement and progress in matters relating to the National Guard. A large proportion of the States now have annual encampments, during their attendance on which the troops receive a modicum of pay sufficient at least to partially compensate the loss involved in their absence from their accustomed avocations, and which, as schools of instruction in those particulars of drill and administration which are impracticable in armories, cannot be too highly esteemed, provided always that they are

so conducted as to be in reality schools rather than places of amusement. Rifle-ranges are also being very generally provided, and, as a consequence, a much higher degree of efficiency in the use of arms of precision is being attained. Another matter of importance which deserves notice is the growing disposition to abolish the gaudy, cumbrous, and distinctive uniforms hitherto worn, and to substitute for them the less showy, but far more comfortable and, on serious service, more impressive, fatigue-dress of the regular army. Another step in the right direction is the compression of nominal divisions into actual brigades, and the resulting diminution of unnecessary generals and staff officers. These and like reforms give token of a spirit which, if properly encouraged by the people, will result in bringing the National Guard to a standard of excellence far in advance of that hitherto reached by it.

AMONG the articles which will be published in the pages of THE UNITED SERVICE magazine during the coming year will be the following of special interest: "The War of 1812," by Colonel T. Bailey Myers; "Blockade Yarns," by Captain J. E. Jouett, U.S.N.; "Feeding a Great Army," by an Army Officer; "Education of Naval Constructors," by Naval Constructor T. D. Wilson, U.S.N.; "The Art of War," by Lieutenant A. W. Greely, U.S.A.; "The First Englishman in Japan," by Captain R. S. Collum, U.S.M.C.; "The Bon Homme Richard," and "The Kearsarge and Alabama," by Rear-Admiral George H. Preble, U.S.N.; "Incidents in the Career of an Army Chaplain in the Rebellion," by H. Clay Trumbull; "Ironclad Cruisers for the Navy," by Commodore E. Simpson, U.S.N.; "Heavy Guns," by Professor John M. Brooke; "A Pennsylvania Reserve Sketch," by an Old Reserve; "The Career of Commander W. B. Cushing, U.S.N.," by Rear-Admiral Daniel Ammen, U.S.N.; "How to make Post Gardens Pay," by Captain Burnet Landreth; "Collisions at Sea," by Lieutenant Seaton Schroeder, U.S.N.; "The Battle of Gettysburg," by the Comte de Paris; "The Paraguayan Expedition," by Medical Director E. Shippen, U.S.N.; "The Battle of Kiskimminetas," by Lieutenant J. E. H. Foster, U.S.A.; "General Grant in the East," by a Naval Officer; "Army Reminiscences," by General Wesley Merritt, U.S.A.; "The Lighthouse Board," by T. B. Johnson; "Early Indian Wars," by General Thomas Cram, U.S.A.; "Reform in the Navy," by Captain W. T. Truxtun; "A Chapter of Secret History," by Colonel M. N. Wisewell, ex-Military Governor of Washington; "The Volunteer Navy," by Jesse E. Dow, of the Navy Department; and "The Diary of an Officer of the Revolution." In addition to the foregoing, already in hand or promised, there will be a

series of papers on militia topics by officers of reputation in the militia service, and reprints of important articles from the foreign service publications.

THANKSGIVING has come and gone with its holocausts of turkeys and its copious libations of soul-cheering wine. And now Christmas, grand old feast of the Church, draws on apace. The former is especially the holiday of the elders, the workers in the world's busy hive, whose labors, under the blessings of heaven, win the golden plenty which the day is set apart to acknowledge; the latter is peculiarly the gala-day of the little ones, who are so dear to Him whose birth it commemorates. The Army and Navy, while not so immediately affected as are men in civil pursuits by the revival of business prosperity, which has made Thanksgiving this year so generally and heartily observed, have yet, no doubt, found good reason to rejoice in the bright hope which it holds out of exemption from the clamor for reduction, for which the hard times, now happily overpassed, have furnished an excuse. Christmas, too, has charms for Army and Navy people as well as for civilians. The thrifty captains, like good housewives, are wont at this season to look to the larders of their enlisted men, and to take timely measures to insure a plentiful supply of creature comforts for their faithful followers. And in the army at least, away out on lonely frontier posts, there are plenty of children who, as confidently as their cousins in the States, look joyously forward to the good time coming, and anticipate with watering mouths the gracious advent of the good St. Nicholas. To all, old and young, on ship or shore, THE UNITED SERVICE, as it goes to press, breathes heartfelt greeting.

SERVICE LITERATURE.

So many inquiries have been received as to the remaining volumes of the Comte de Paris' history of our civil war that we are permitted to publish the following extract from a letter addressed by the Comte de Paris to Messrs. Porter & Coates:

"I return to-day to my usual work, which is presently the account of the battle of Chickamauga. My going three times to Spain in less than fifteen months, once for a marriage and twice on the occasion of great domestic sorrows, has greatly delayed my work, which becomes more arduous as I get more documents and more information. I shall soon begin the account of Grant's Chattanooga campaign; but with the minor subjects, such as the siege of Charleston, the legislation, etc., I cannot expect to have my next two volumes ready to be put into Mr. Levy's hands before the end of this year. These two volumes will be printed and published together. As soon as a single sheet is printed and corrected it will be sent to you, so that you will receive the first a long time, perhaps nine or ten months, before the two volumes are given to the public. The same will be done for the maps.

"If people believe that I have given up my work, they are greatly mistaken; but if they imagine that it is an easy task, they are still more mistaken."

CAPTAIN H. W. HOWGATE, U.S.A., has just published "The Cruise of the Florence," a small volume giving a graphic account of the cruise of the vessel named in the Arctic Seas.

JUDGE COWLEY, who will be pleasantly remembered as Judge Advocate of the old S. A. B. Squadron, has added another volume to the naval history of the late war by his "Leaves from a Lawyer's Diary, Afloat and Ashore," which is a general review of the operations of the squadron named, from its organization till the final hauling down of its flag at the close of the war.

"WITH General Grant in the East," by Dr. John M. Keating, in addition to its general merits, contains much of interest to the Navy by reason of its frequent references to naval officers and vessels in the East.

GENERAL EMORY UPTON is engaged on a work to be called "The Military Policy of the United States." It will treat of the various wars in which the country has been engaged, and will require two years more for its completion.

"THE Memoir of Colonel Ulric Dahlgren," by Admiral Dahlgren, is out of print. Mrs. Dahlgren is now writing a life of her husband, the late admiral.

PROFESSOR WHEELER'S book on "The Elements of the Art and Science of War," has been honored by being adopted for use in many of the military schools of the country.

"THE Campaigns of the War of 1812–15," by General Cullum, just issued, has met with a most favorable reception from the critics and the public.

THE novel entitled "Lord Strahan," which was published anonymously, and which has met such a flattering reception, is by Mrs. Wildrick, wife of Colonel Wildrick of the army.

THE publishers of THE UNITED SERVICE have just issued a monograph by Rear-Admiral Daniel Ammen, U.S.N., on "The American Inter-Oceanic Ship Canal Question," which gives a comprehensive review of all the points involved in that important subject.

GENERAL J. C. PEMBERTON is now writing a history of the siege of Vicksburg, in which he commanded on the Confederate side. It will doubtless be a valuable contribution to the literature of the civil war.

IT is announced that Eastlake's "Invasion of the Crimea," which, under the comprehensive plan adopted by its author, would require several volumes for its completion upon the original scale, is to be brought to a sudden conclusion in one more volume.

"THE History of the Indian Mutiny, 1857–58," by Colonel G. B. Malleson, R.A., is one of the most important and interesting military works recently issued abroad.

*** THE Editors of THE UNITED SERVICE will be pleased to receive from officers and others, literary notes, similar to the above, of interest to the two services.